

A Lean implementation framework encompassing South African Ubuntu

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"In Africa there is a concept known as 'ubuntu' - the profound sense that we are human only through the humanity of others; that if we are to accomplish anything in this world it will in equal measure be due to the work and achievement of others."

Nelson Mandela

ABSTRACT

Lean, a management philosophy originating from Toyota, is used to eradicate wastes and increase efficiency within an organisation. Even though Lean philosophy has become a global phenomenon, only about 10% of the implementations are done appropriately. Thus around 90% of Lean implementations fail, due to a multitude of reasons. As many researchers have begun to investigate the barriers of Lean implementation, they have found that culture plays an important role in the success or failure of Lean implementations. Within any organisation striving to be Lean, there are three main cultures at play: organisational culture, Lean culture and national culture. At times, the different types of cultures may cause poor synergy within an organisation. Ergo, it has been recommended that more investigations and research be done on Lean cultural adaptations within different countries.

Ubuntu is the ancient African concept of “Humanness”, or what it means to be human. While South Africa is famously known as the rainbow nation for its diversity, it is believed that Ubuntu is the culture that unites all South Africans. The majority of South Africans unconsciously practice the teaching of Ubuntu regardless of their race, language or traditions, as the Ubuntu values and principles have become a part of the daily lives of South Africans. Since the 1990s, Ubuntu has transcended into the management sphere, giving rise to the Ubuntu management philosophy, which incorporates traditional Ubuntu teaching into the modern business world.

Previous research has explored the relationship between Lean management philosophy and Ubuntu management philosophy. It was found that these philosophies share various correlations and have variations between them.

This study, therefore, focuses on the problem of low Lean implementation success rate in South Africa, due to a lack of culture-specific Lean implementation frameworks. In order to address this problem, the aim of this study is to develop a culture-specific Lean implementation framework for South Africa, utilising the Ubuntu management philosophy.

This research followed the elaborated action design research (eADR) methodology, utilising the diagnosing, concept design and build stages. A systematic literature review was conducted, during the problem diagnosing stage, in order to explore existing South African Lean implementation frameworks and investigate culture-specific frameworks. However, it was found that no culture-specific Lean implementation frameworks exist in South Africa.

For design stage 1, interviews were conducted with Ubuntu experts to explore established Ubuntu common practices and derive Ubuntu management principles that would correlate with the Lean

principles that did not have correlating Ubuntu principles. This resulted in the naming of five Ubuntu principles that correspond to the process themed Lean principles.

During design stage 2, a further systematic literature review was conducted. This allowed for the exploration and analysis of available Lean frameworks, in order to determine common design methods and elements amongst them. This led to the development of the “House of guidance for designing a Lean framework”, which included the following: 1) guidelines to the applicable literature to consider, 2) design elements to include, 3) design methods to consider, and 4) methods to test a Lean framework.

The third design stage of this study guided the design and development of “the Lean-Ubuntu implementation framework”. This framework was designed by utilising the “House of guidance for designing a Lean framework” (from design stage 2) and incorporated the matching Lean and Ubuntu principles (from design stage 3). The framework offers a guideline for practical implementation of Lean in a South African organisation. It considers the actions that must be taken on the three levels of business execution (strategic, tactical and organisational) and the organisation through the three stages of change.

The newly designed Lean-Ubuntu implementation framework was verified and validated by surveying South African Lean experts.

The framework could act as a bridge for South African organisations striving to implement Lean, aiding them in understanding the Lean principles better and contributing to a more successful Lean implementation.

Key words

Lean management philosophy, Ubuntu management philosophy, systematic literature review, SLR, semi-structured interviews, elaborated action design research, Lean analogy, Lean implementation framework, South Africa

PREFACE

This thesis was compiled and presented in article format in accordance with the academic rules of the North-West University (Approved on 21 September 2017 with revisions in March 2020).

Rule A.5.10.5 states:

“Where a candidate is allowed to submit the research product in the form of research articles, such research product must be presented for examination purposes as an integrated unit, supplemented with a problem statement, an introduction and a synoptic conclusion as prescribed by faculty rules and the manuscript submission guidelines, or the url link to the manuscript guidelines of the journal or journals concerned”

Rule A.5.10.8 states:

“Where any research article, manuscript or internationally examined patent to which the candidate for a doctoral degree and other authors or inventors have contributed is submitted as the research product of a doctoral degree programme, the candidate must obtain a written statement from each co-author and co-inventor in which it is stated that such co-author or co-inventor grants permission for the research product to be used for the stated purpose, and in which it is further indicated what each co-author's or co-inventor's share in the research product concerned was.”

Rule A.5.10.9 states:

“Where co-authors or co-inventors as contemplated in rule 5.10.8 were involved in the development of the research product, the candidate must mention this fact in the preface, and must include the statement of each co-author or co-inventor in the thesis, mini-thesis or research report immediately following the preface to the research product”

The following research paper was published during the course of this research study:

- Mangaroo-Pillay, M. and Coetzee, R., 2020, “Categorising South African Lean implementation frameworks: a systematic literature review”. SAIE 31 conference proceedings

The following research paper was accepted by the Journal of Industrial Engineering and Management during the course of this study:

- Mangaroo-Pillay, M. and Coetzee, R., “Lean frameworks: A systematic literature review (SLR) investigating methods and design elements”

The following research paper was submitted to the International Journal of cross-cultural Management during the course of this study:

- Mangaroo-Pillay, M., Niesing, C and Coetzee, R., “Ubuntu Management: A lens for Lean philosophy in South Africa”

ARTICLE-BASED THESIS: LAYOUT, NUMBERING AND REFERENCING

This is an article-based thesis, which causes the layout, numbering and references to be inconsistent. Moreover, the articles may cause the overall thesis to appear shorter in page numbers, due to the shortened nature of article writing.

Layout - The three research papers that form part of this thesis are composed according to the prescribed author guidelines as stipulated by the editors of each journal or publication. Ergo the appearance, page numbers and format of chapters 4-6 therefore differ from other chapters found in the thesis.

Numbering – The page numbers of articles will conform to the specific publication page numbers and will interrupt the numbering of the rest of the thesis. The numbering of tables, figure and equations will restart in their respective research papers.

References –The list of references for chapter 4-6 can be found at the end of their respective chapters (research papers), whereas the referencing for the other chapters can be found at the end of the thesis.

Literature – Literature will be distributed between chapter 2 and the articles. Some literature may also be duplicated from the literature study (chapter 2) in the research papers (chapter 4-6). This can be attributed to the fact that research papers need to stand on their own and contain their own literature studies.

STATEMENT OF CO-AUTHORS

To whom it may concern,

The listed co-authors hereby give consent that Mia Mangaroo-Pillay may submit the manuscript(s) as part of her thesis titled “**A Lean implementation framework encompassing South African Ubuntu**” for the degree Doctorate in Industrial Engineering, at the North-West University (NWU):

(This letter of consent complies with rules **A.5.10.8** and **A5.10.9** of the academic rules, as stipulated by the North-West University)



Dr Rojanette Coetzee

8 Nov 2021

Date

Potchefstroom

Signed at



Dr Christi Niesing

08/11/2021

Date

Potchefstroom

Signed at

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CHAPTER 1

Introduction

This chapter scopes the research problem and discusses the aim and objectives for the overarching study.

1.1. Background

1.1.1 Background on Lean philosophy and culture

Lean is a management philosophy, originating from Toyota, that is used to eradicate wastes and increase efficiency within an organisation (Womack and Jones, 2003, Holweg, 2007). In recent years, Lean philosophy has become a global phenomenon, however according to Miina (2012) only about 10% of the implementations are done successfully (Miina, 2012). Thus around 90% of Lean implementations fail due to a multitude of reasons.

Many researchers have begun to investigate the barriers of Lean implementation, with most citing a host of causes. Authors (Nordin et al., 2012a, Erthal and Marques, 2018, Alkhoraif and McLaughlin, 2016, Martins et al., 2015, Ahmad, 2013, Taherimashhadi and Ribas, 2018, Amer and Shaw, 2014) have explained that culture plays an important role in the success or failure of Lean implementations. They have clarified that inappropriate or incorrect culture, that does not align with Lean culture, may cause Lean implementation ventures to fail (Nordin et al., 2012a, Erthal and Marques, 2018, Alkhoraif and McLaughlin, 2016, Martins et al., 2015, Ahmad, 2013, Taherimashhadi and Ribas, 2018, Amer and Shaw, 2014).

Liker et al. (2008) justify that complexity of culture within an organisation can be seen in the various levels of the organisation. Figure 1 illustrates the different cultural aspects within any given organisation with the first overarching one being national culture, which encompasses industry culture. Only thereafter is organisational culture considered, but it contains subcultures of its own, such as groups and cliques.

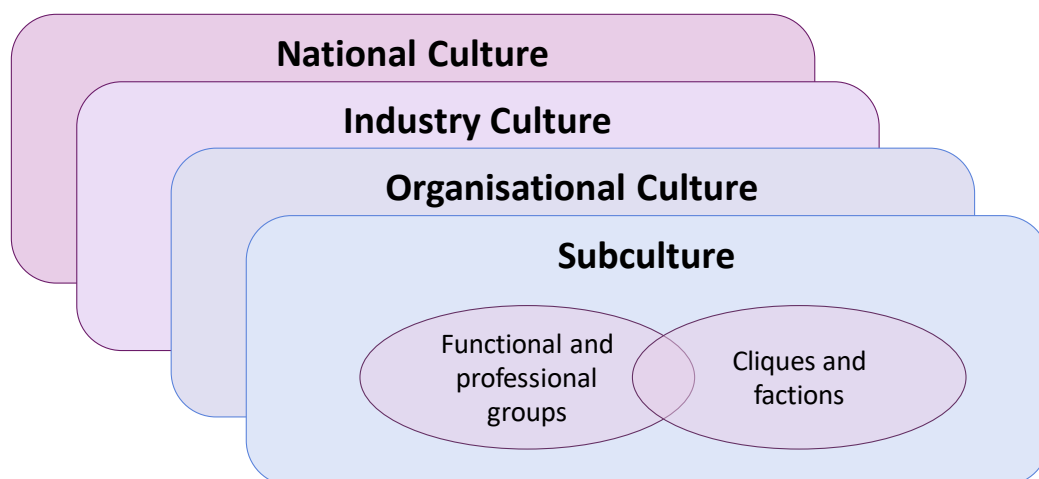


Figure 1: Cultures at various levels (Adapted from Liker et al. (2008))

Given that Lean originated from Toyota, Lean culture is paralleled to Toyota culture. In a book on the topic, Liker et al. (2008) expresses that culture is a complex subject that is very difficult to

define. However, Liker et al. (2008) stated that the following definition by Schein Edgar is the best description for Toyota (Lean) culture:

“The pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaption and internal integration, and that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.”

In figure 1, national culture is described as the values, beliefs and assumptions learned from the onset of childhood, that differentiates one country's individuals from another (Newman and Nollen, 1996, Hofstede, 1991). Furthermore, national culture is deeply rooted in the everyday life and is considered to be somewhat impervious to change (Newman and Nollen, 1996). Whereas industry and organisational cultures are beliefs, values and norms originating from the specific industry or organisation.

Although cultural difference has been identified as a barrier to Lean implementation (Melton, 2005, Worley and Doolen, 2006, Nordin et al., 2012a); a recent review on Lean research found a gap in the literature, stating a “...lack of cross-country and cross-national cultural comparisons” (Danese et al., 2018). This led to their recommendation for a “robust and generalised framework and guidelines for managers to support the Lean transformation” (Danese et al., 2018).

A guideline framework (figure 2) was suggested by Ahmad (2013), in order to structure future research in the cultural sphere regarding Lean. Figure 2 provides a route for guiding successful transition from a non-Lean organisation into a Lean one. Ahmad (2013) explains that the current state of the non-Lean organisation must first be understood and only then an attempt should be made to understand the Toyota culture. Thereafter, the focus should shift to the adaptivity and fit of the people and continuous improvement processes. Additionally, the cultural dimensions of Lean must be considered at this stage as well, thereby placing emphasis on national, organisational and work culture of the company and industry. Once the balance amongst the aforementioned elements is achieved, the adaption of Lean culture may take place. The newly established Lean culture will be influenced by the organisational, national and work cultures. Figure 2 illustrates this, along with the need for research into the adaptation of national cultures into Lean culture.

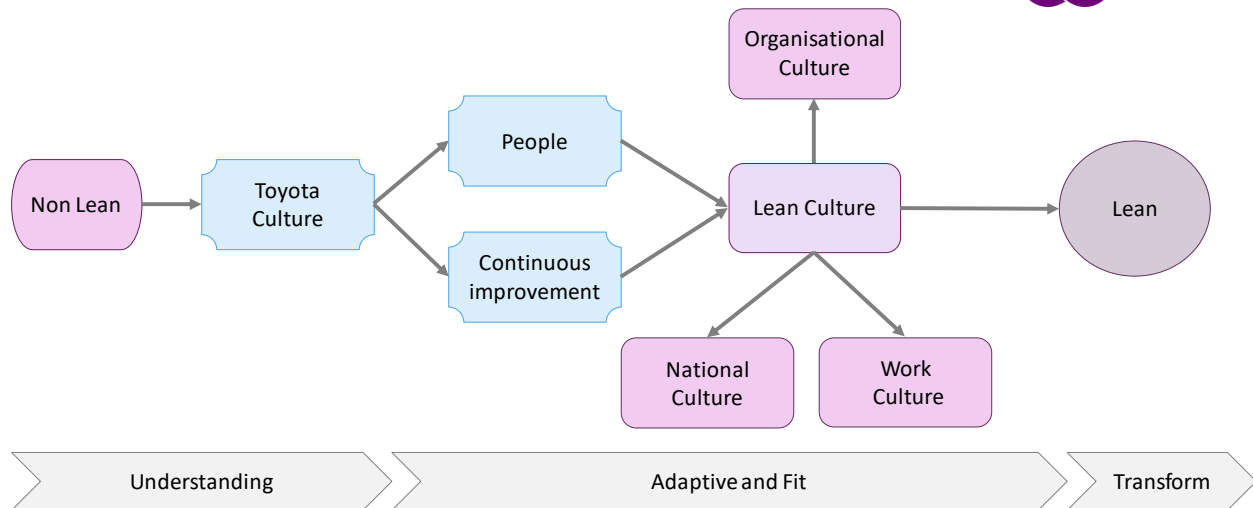


Figure 2: Lean culture framework for future research (Adapted from Ahmad (2013))

Several researchers (Nordin et al., 2012a, Erthal and Marques, 2018, Alkhoraif and McLaughlin, 2016, Martins et al., 2015, Ahmad, 2013, Taherimashhadi and Ribas, 2018, Amer and Shaw, 2014) have recommended that more research be done on national cultural adaptations of Lean implementation.

1.1.2 Previous research in the South African context

A previous study explored a cultural Lean analogy, by creating a South African Ubuntu analogy of Lean philosophy (the Lean-Ubuntu analogy)(Mangaroo-Pillay, 2020, Mangaroo-Pillay and Coetzee, 2021). This was the first and only study to investigate the correlation between Ubuntu and Lean.

Ubuntu is the ancient African concept of “humanness” or what it means to be human (Broodryk, 2005). While South Africa is famously known as the rainbow nation for its diversity, it is believed that Ubuntu is the culture that unites all South Africans. The majority of South Africans unconsciously practice the teaching of Ubuntu regardless of their race, language or traditions. The Ubuntu values and principles have become a part of the daily lives of South Africans and it is said that Ubuntu often governs the way most South Africans live their lives (Broodryk, 2007). In the 1990’s, the Ubuntu management concept was developed (Karsten and Illa, 2005a), which captures the essence of the Ubuntu philosophy, while illustrating it as a modern business philosophy (Broodryk, 2005, Msila, 2015). It is imperative to note that while Ubuntu is an ancient concept, it has only been documented recently. Thus, the aforementioned studies by Broodryk and Msila are pinnacle studies in defining Ubuntu as they are pioneers in the Ubuntu research space. Broodryk’s books from 2005 and 2007 are some of the first academic documentations of Ubuntu. Recent studies focus on implementations of Ubuntu in different research spaces.

The study conducted by (Mangaroo-Pillay and Coetzee, 2021) aimed to enhance the understanding of the Japanese Lean management principles in the South African context, by creating an Ubuntu analogy of Lean. An SLR was conducted on the Lean management principles and the Ubuntu management principles. By extracting the management principles from these philosophies, the authors were able to compare and contrast them. Ergo, resulting in the creation of the Lean-Ubuntu analogy diagram, illustrated in figure 3.

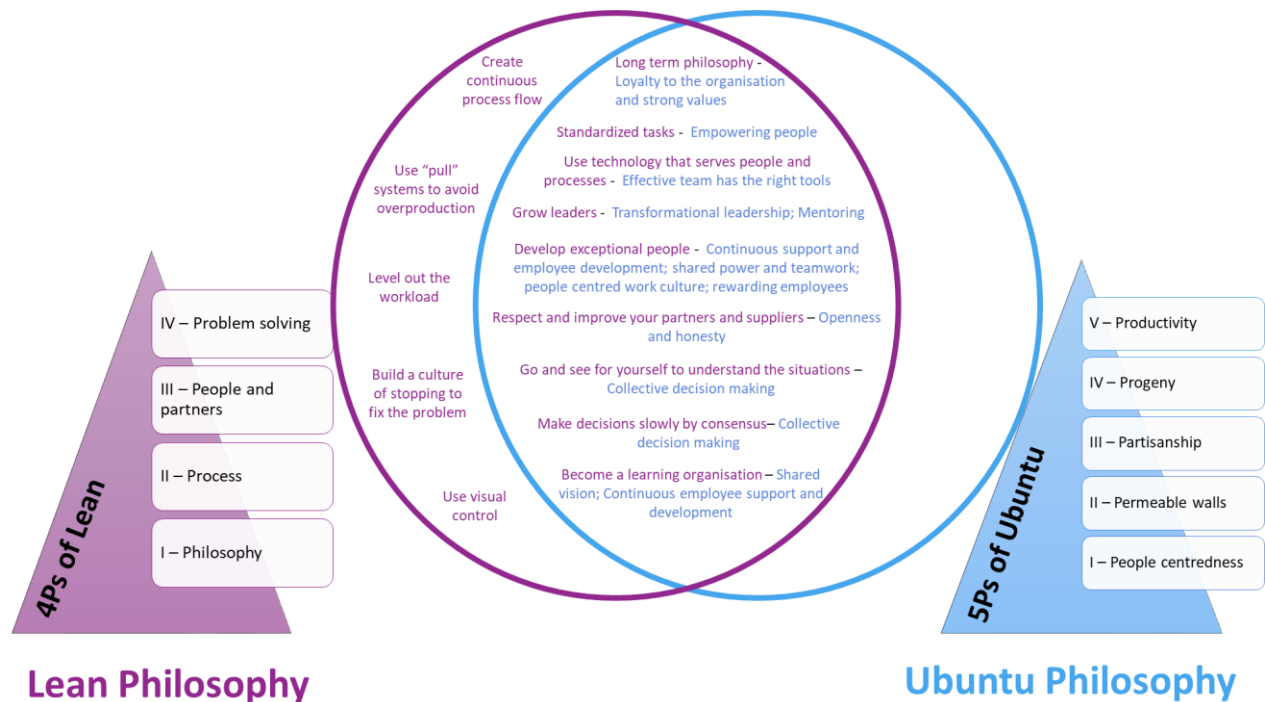


Figure 3: The Lean-Ubuntu analogy (Taken from Mangaroo-Pillay and Coetzee (2021))

From figure 3, the four levels of Lean philosophy can be seen in comparison with the 5 levels of Ubuntu philosophy. This juxtaposition and similarity is further highlighted by the Venn diagram in the centre of the figure, which illustrates the overlap of the two philosophies and emphasised the unmatched Lean principles.

While this research provides a promising approach to a Lean cultural adaptation for South Africa, the authors did not explore variations between Ubuntu and Lean. Due to the fact that Lean management principles are very practical in nature (process focused), there are various principles that do not have a corresponding Ubuntu principle (depicted on the left of the Venn-diagram in figure 3). In addition, no attention was given to the details of implementing the literature-based framework that was designed.

1.2 Problem statement /opportunity

The research problem to be addressed, is the low Lean implementation success rate in South Africa due to a lack of culture-specific Lean implementation frameworks, adapted for the diverse culture of South Africa.

1.3. Research aim

The aim of this research is therefore to develop a culture-specific Lean implementation framework for South Africa, utilising the Ubuntu management philosophy.

1.4. Research scope

The research will follow the eADR (elaborated action design research) methodology as an overarching research design (to be discussed in chapter 3). However, the study will stay within the diagnosing and design stages of eADR. Future research will explore the implementation and evolution stages of eADR. Ergo, this study will explore the design of a framework, as mentioned in section 1.3 and will test the design framework based on the expert input of South African Lean experts, as a newly designed framework cannot be implemented before it tested conceptually (i.e. on paper)

1.5. Research objectives

In order to achieve the aim, the following objectives are set:

1. Investigate and prove that there is no culture-specific, South African, Lean implementation framework, by means of a systematic literature review. – **Available in chapter 4**
2. Develop Ubuntu principles for the unmatched Lean principles (of the previous study), by conducting interviews with Ubuntu experts. – **Available in chapter 5**
3. Investigate Lean framework development (in terms of literature, methods, design requirements and testing), via a systematic literature review. – **Available in chapter 6**
4. Design a Lean-Ubuntu implementation framework. – **Available in chapter 7**
5. Verify that the Lean-Ubuntu implementation framework complies with the design requirements by surveying Lean experts. – **Available in chapter 8 and 9**
6. Prove that a valid problem, method and created artefact was used in this study by surveying Lean experts. – **Available in chapter 8 and 9**

1.6. Field of research

Industrial Engineering may be broken up into various areas. According to Salvendy (2001), there are four basic areas of industrial and systems engineering (operations research, human factors engineering, management systems and manufacturing systems engineering), as depicted in figure 4. Each of the aforementioned basic areas overlap with knowledge and application areas (Mathematics, statistics, accounting, economics and psychology).

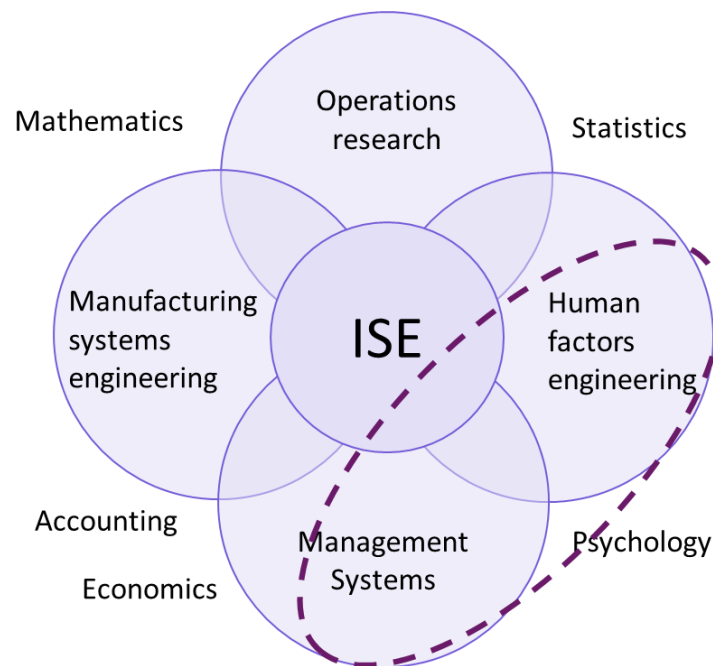


Figure 4: Domains of Industrial and Systems Engineering (ISE) (Adapted from Salvendy (2001))

However, by 2021 these areas have been expanded upon by the Institute of Industrial and Systems Engineering (IISE). According to the IISE there are 14 knowledge areas of Industrial and Systems Engineering (IISE, 2021), as represented in figure 5.

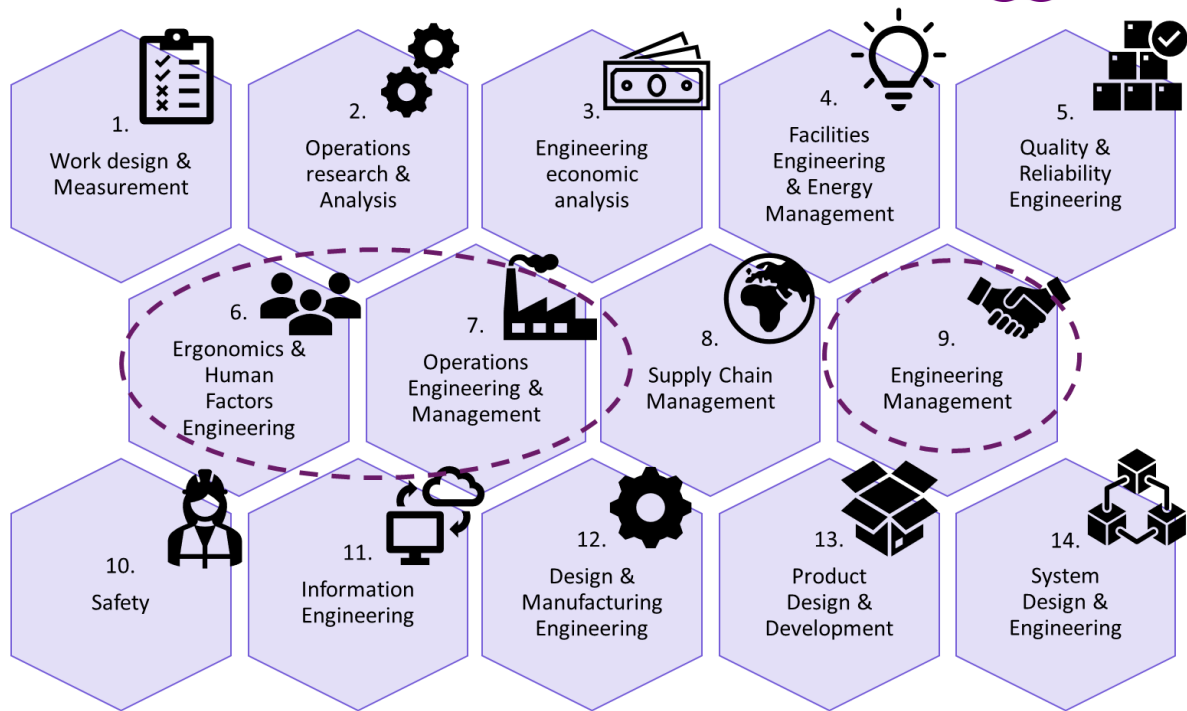


Figure 5: Knowledge areas of Industrial and Systems Engineering (Adapted from the Institute of Industrial and Systems Engineering Body of Knowledge (IISE, 2021))

Considering the domains (figure 4) and knowledge areas (figure 5) of industrial and systems engineering, this study was conducted within the field of industrial engineering. It has a specific focus on management systems and human factors engineering (showcased in figure 4, with a dashed line). In addition to this, the study also encompasses operations engineering (illustrated in figure 5, with a dashed line). These areas are supported by foundational knowledge in areas like psychology and operational excellence.

1.7. Chapter divisions

Table 1 illustrates the chapter divisions for the thesis.

Table 1: Chapter division

Research Phase	Chapter	Contents	Research Objective covered
N/A	Chapter 1	Introduction	N/A
N/A	Chapter 2	Literature study	N/A
N/A	Chapter 3	Research design	N/A
Diagnosing	Chapter 4	SLR on SA frameworks	Research objective 1
Design 1	Chapter 5	Interviews with Ubuntu experts	Research objective 2
Design 2	Chapter 6	SLR on Lean framework design methods and elements	Research objective 3
Design 3	Chapter 7	Design of the Lean-Ubuntu implementation framework	Research objective 4

Design 3	Chapter 8	Survey design and framework evaluation	Research objective 5 and 6
N/A	Chapter 9	Verification and Validation	Research objective 5 and 6
N/A	Chapter 10	Conclusions	N/A

1.8. Chapter summary

This chapter scopes the research problem and sets out the aim for the study. The following chapters will discuss the relevant literature and explore the research design.

CHAPTER 2

Literature study

This chapter examines the relevant literature on Lean, Ubuntu, change management and different research methods.

(Some of the literature that is presented in this chapter may also feature in chapters 4-6. This is attributed to the research papers needing to stand on their own when published.)

2.1. Introduction

The essence of this chapter is to explore and discuss the relevant literature for this research study. The literature study is broken up into four main sections: Lean (§ 2.2), Ubuntu (§ 2.3), Change models (§ 2.4) and Research methods (§ 2.5). Figure 6 illustrates the detailed breakdown for the subsections of each of the four main sections.

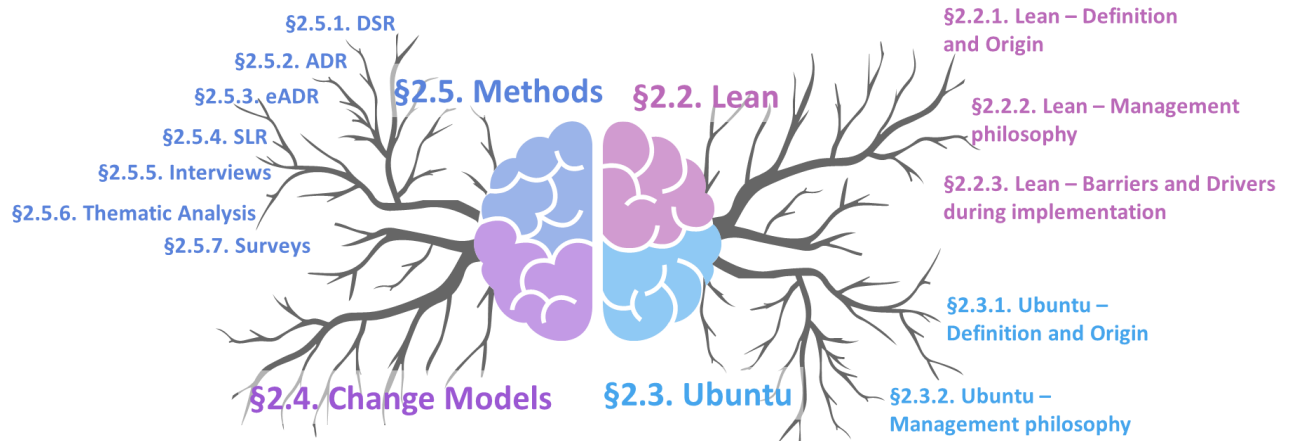


Figure 6: Mind map of the literature study

2.2. Lean

2.2.1. Lean – Definition and Origin

The Lean philosophy has its humble beginning in the 1930s in Japan (Holweg, 2007). Lean is a continuous improvement management philosophy, that is used to increase productivity and profits, while eliminating wastes (Holweg, 2007, Womack and Jones, 2003). Lean has become known in various spheres by different names such as “Lean manufacturing”, “Lean production”, “Lean thinking” and “Lean”, thus making Lean polyonymous (Mangaroo-Pillay, 2020, Emiliani, 2006). However, given that multiple academics and practitioners consider Lean to be a philosophy, it has been given the title of “Lean philosophy” (Sezen and Erdogan, 2009).

Though Lean has its fame in the automotive industry, due to Toyota, it can be traced back to the early 1890s when Sakichi Toyoda designed and patented a manual loom (Emiliani, 2006). This loom brought radical improvements to productivity of workers and quality of products - elements which have become part of the foundation of modern day Lean philosophy (Emiliani, 2006). The descendants of Sakichi Toyoda went on to create and establish Toyota and the Toyota Production System (TPS) (Emiliani, 2006, Holweg, 2007).

Taiichi Ohno's is widely credited for his work on TPS, with its focus on waste reduction and improvement of overall customer value (Ohno, 1988). It is noteworthy that TPS is never to be utilised a toolbox, rather it is seen as an advanced production system in which all the parts contribute to the whole (Chiarini et al., 2018). TPS has a strong foundation built on the Toyota way philosophy, visual management, standardised processes and levelled production (Coetzee, 2018). Moreover, TPS has roots in just-in-time and Jidoka (machines that stop automatically), and is people centred (Coetzee, 2018).

Notwithstanding that Lean has its beginnings in Toyota, it was primarily studied by the Massachusetts Institute of Technology (MIT) and popularised as the "Lean production system" in the book *The machine that changed the world* (Womack and Jones, 2003, Sezen and Erdogan, 2009, Womack et al., 1990). However, the use of the word "Lean" was strategically selected to emphasise the juxtaposition between the "mass production" systems in the west and the Toyota system in the east (Holweg, 2007, Womack and Jones, 2003). Subsequently, the first use of the word "Lean" to describe the system of Japanese production dates back to 1988, when John Krafcik first used it to explain how the Japanese could "do more with less" (Sezen and Erdogan, 2009).

Womack and Jones (2003) explained that Lean philosophy has five principles:

1. **Value** – Value is always defined from the perspective of the customer
2. **The value stream** – Map out the set of actions needed to create or deliver the products
3. **Flow** – Aim to achieve continuous flow throughout all processes
4. **Pull** – Use a pull system, thereby only making what a customer wants, when they want
5. **Perfection** – Continuously strive for the perfect products or services

2.2.2. Lean – Management philosophy

In section 2.2.1, the origins of Lean were explained as stemming from the Toyota production system (TPS). Liker (2004) clarifies that in the 1980s, the value and distinction of Japanese quality and efficiency became evident at Toyota. American automotive companies could not keep up with Toyota. Toyota's cars were designed to be faster and more reliable, whilst retaining Toyota relatively high salaries for employees (Liker, 2004).

According to Liker (2004), the secret of Toyota's success has become widely known. It has been attributed to their ability to turn operational excellence into a strategic weapon, which in turn has led to the development of Lean tools and quality improvement methods (Liker, 2004), such as:

- Heijunka - Production levelling or smoothing is a method for reducing the chance of overburdening.
- Jidoka – An automatic machine that comes to a safe stop when a problem or defect occurs
- Just-in-time (JIT) – A form of inventory management that ensures minimum inventory at hand to reduce waste
- Kaizen – Continuously improving an organisation
- One-piece flow – A single unit of production flow, as opposed to a batch, thereby reducing work in progress (WIP)
- 5-why – A root cause analysis tool, allowing the user to get to the root of a problem by continuously asking “why?”
- 8 wastes – Non-value adding activities that create waste in a process (namely: Transport, inventory, movement, waiting, overproduction, overprocessing, defects and unused employee creativity)
- 7s – Good housekeeping concepts to improve productivity and quality with an organisation (namely: Sort, Set in order, Shine, Standardize, Sustain, Safety and Spirit)
- SMED – Single method exchange of die, which is a system for drastically reducing the time it takes to complete equipment changeovers.

However, the true impact of the Lean philosophy cannot be accomplished using these tools alone as Lean has a deep-seeded business philosophy based on the understanding of people and human motivation (Liker et al., 2008, Liker, 2004). These business aspects are captured in the 14 Lean management principles within the “4P model of the Toyota way (illustrated in figure 7).

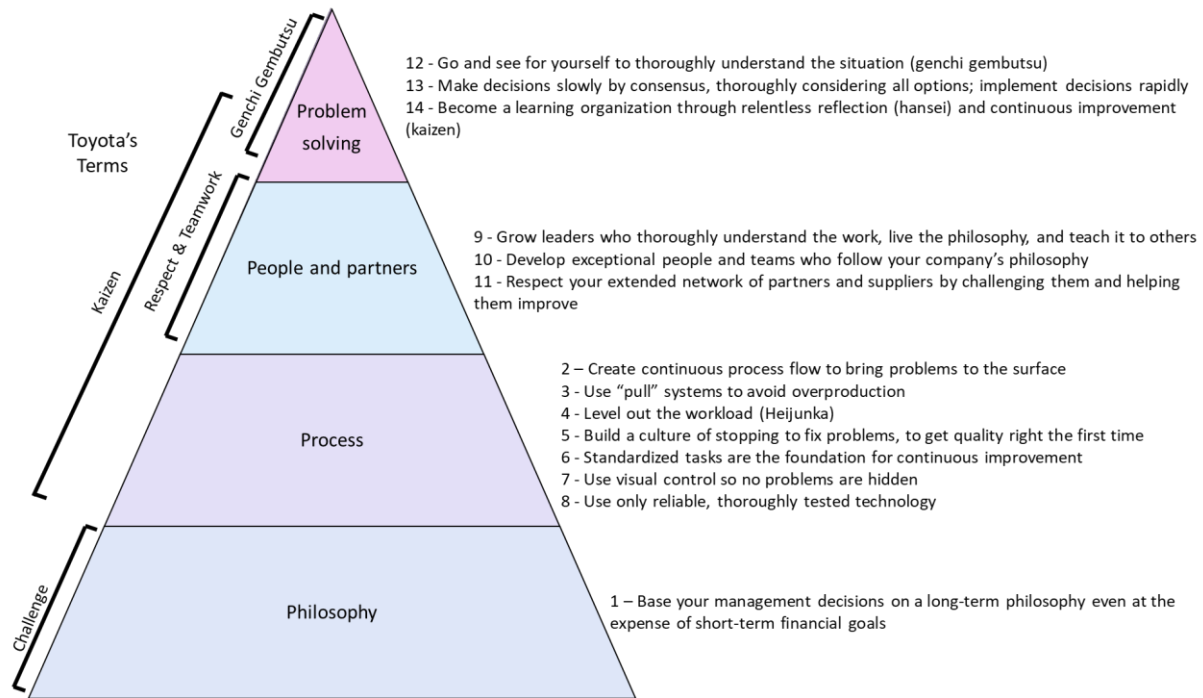


Figure 7: The "4P" model of the Toyota way (adapted from Liker (2004) and replicated from Mangaroo-Pillay (2020))

In figure 7, the listed principles allow for organisations to develop a Lean culture by starting with a strong foundation in Lean philosophy and thereafter improving processes. Thereafter, develop the people and partners of the organisation before starting to solve problems within the organisation. The principles illustrated in figure 7 are further explained and elaborated upon in chapter 5 (the research paper on interviews with Ubuntu experts).

2.2.3. Lean – Barriers during implementation

As Lean philosophy has grown in popularity worldwide, it has been subjected to multiple research endeavours, with several researchers and academics investigating the implementation success factors and barriers to Lean implementation (Achanga et al., 2006, Amer and Shaw, 2014, Fadly Habidin and Mohd Yusof, 2013, Hilton et al., 2012, Martínez-Jurado and Moyano-Fuentes, 2014, Laureani and Antony, 2012, AlManei et al., 2017).

AlManei et al. (2017) conducted research on Lean implementation challenges in organisations. This research resulted in the development of the force field analysis of Lean barriers and drivers via a change model analogy, depicted in figure 8.

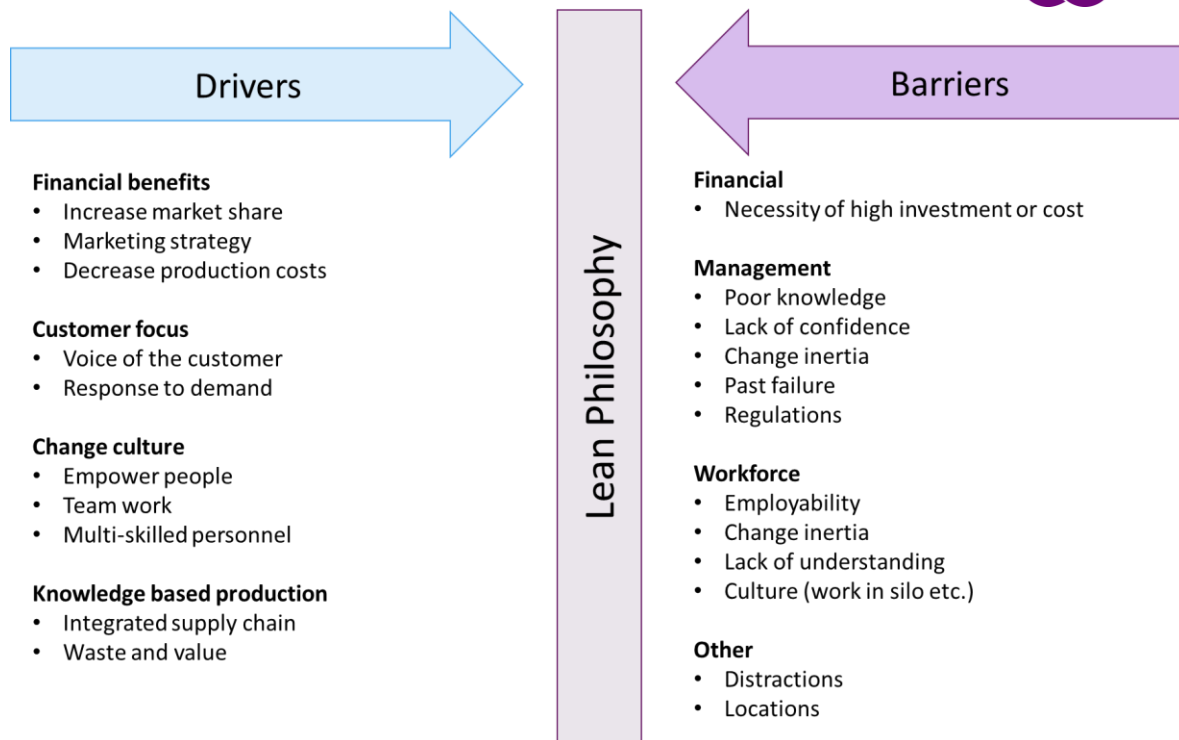


Figure 8: A force field analysis of Lean barriers and drivers (Adapted from AlManei et al. (2017))

From figure 8, it can be observed that there are various drivers and barrier to Lean implementation in practice. Some of the barriers include current workforce culture (when working in silos) and a lack of understanding of Lean philosophy (AlManei et al., 2017).

It is imperative to note that research shows that Lean originated in Japan and is widely based on Japanese culture, norms and folklore, ergo it can be argued that Lean is inherently Japanese (Wittrock, 2015). Moreover, Nordin et al. (2012a) found that the transition from traditional management philosophies to Lean is principally an organisational cultural change matter, as opposed to only a technical or manufacturing matter. It is understood by various sources (Bamber and Dale, 2000, Bhasin, 2011, Bonavia and Marin, 2006, Crute et al., 2003, Lee-Mortimer, 2008, Nordin et al., 2012a, Wong et al., 2009, AlManei et al., 2017) that misunderstanding the concept and purpose of Lean is a barrier to Lean implementation. Additionally, researchers (Melton, 2005, Worley and Doolen, 2006, AlManei et al., 2017) have identified that cultural differences act as an additional barrier to Lean implementation (Nordin et al., 2012a).

While Lean philosophy has grown in popularity over the past decade, the success rate for Lean implementation remains relatively low overall (Coetzee et al., 2016, Liker, 2003, Bhasin, 2012, Miina, 2012). Considering that the low success rate for Lean implementation is a global phenomenon, South African is no different and experiences challenges with Lean implementation.

According to Coetzee et al. (2016), with the focus being played on tangible outcomes, organisations forget about intangible aspects like change, culture and people; this creates barriers to successful Lean implementations. Camagu (2010) found that South African organisations do not link Lean to their current corporate strategies, but rather take it as an ad hoc approach of existing practices. This study also found that there exists a lack of support and adoption from management, which contributes to failed Lean implementations (Camagu, 2010). Furthermore, Camagu (2010) explains that inadequate resources, lack of performance measures, lack of employee empowerment, poor communication, lack of training and no motivation generate barriers to successful Lean implementations.

In a study conducted on Lean barriers in South African, Monyane et al. (2019) found the following barriers to successful implementations:

- Lack of technical capabilities
- Lack of long-term commitment to change and Innovation
- Price oriented tendering system
- Long term relationships with suppliers for fear of complacency
- Limited communication
- Lack of quality management
- Lean beneficial to large projects not small projects
- Extra resources required specific to deal with lean issues
- Lack of understanding of the concepts
- Lack of training
- Lack of support from Management
- Inability to deal with change management
- Culture and social issues
- Transparency
- Financial Issues
- Lack of time for implementing new practices in the Projects
- Challenge to create organizational elements
- Resistance to change

Allu and Emuze (2018) agree with many of the aforementioned barriers. They explain that South Africa experiences many challenges and barrier to successful implementations and Lean sustainability, such as lack of proper competence/knowledge or educational issues, lack of commitment from top management/non-participative management style for workforce/industry, lack of exposure on the need for lean construction/experience, lack of measurement tools/standards, lack of client and supplier involvement, difficulties in understanding the concept of lean construction, negative attitude and inability to work in group, culture & human attitudinal issues (mind-set issues), uncertainty in the supply chain/procurement/ contract-related issues, the tendency to apply traditional management, lack of planning/long-term philosophy, overall lack of support/government support, and cost related (higher investment cost and final cost of implementation) (Allu and Emuze, 2018).

Based on the aforementioned studies, it can be argued that multiple authors agree that the misunderstanding of the concept and purpose of Lean, as well as the cultural differences attribute to barriers of successful Lean implementation. Ergo, it is beneficial to explore ways to address these barriers in this study.

2.3. Ubuntu

2.3.1. Ubuntu – Definition and Origin

Ubuntu is an ancient African philosophy built on the aspects of what it means to be human, or the concept of “Humanness” (Bolden, 2014, Broodryk, 2005, Broodryk, 2007, Inyang, 2008, Mbigi, 1997, Van Den Heuvel et al., 2007). While the existence of this philosophy has spanned several centuries, it has only been formally documented in written literature during the 1990s (Broodryk, 2007). Before its first formal documentation, Ubuntu was verbally preserved, being conveyed from generation to generation. Moreover, this philosophy became the foundation for hope and leadership (Broodryk, 2007).

Ubuntu originated in central African societies and its philosophy migrated with groups of people across parts of the continent (Mangena, 2016, Muxe Nkondo, 2007). During the formation of these new societies, the Ubuntu philosophy began to differentiate ever so slightly, while its core principles remained rooted in its original meaning. Today, the likes of Zimbabwe, South Africa, Mozambique, Ghana, Angola, Botswana, Zambia, Malawi and the Democratic Republic of the Congo (DRC) all showcase and embody the Ubuntu philosophy (Mangena, 2016).

South Africa is acclaimed for its diversity and rich cultural heritage and is therefore deemed the “rainbow nation”. Despite the recognition for its diverse culture, it is believed that Ubuntu is a value or phenomenon that unites all South Africans (Broodryk, 2005). The majority of South Africans unconsciously practice the teaching of Ubuntu regardless of their race, language or traditions, as the Ubuntu values and principles have become a part of the daily lives of South Africans. More convincingly, Broodryk (2005) found traits of Ubuntu in the following South African language groups, stating the names the aforementioned groups may refer to Ubuntu by:

1. Afrikaans – Mensheid
2. English - Humanness
3. isiNdebele - Ubuntu
4. isiXhosa – Ubuntu or Umuntu
5. isiZulu – Ubuntu or Umtu

6. Sesotho and Sepedi – Botho or Motho
7. Setswana - Motho
8. siSwati - Ubuntu
9. Tshivenda – Vhuthu or Muthu
10. Xitsonga – Bunhu

Several authors have accepted that the Ubuntu philosophy lies in the dictum “umuntu ngumuntu ngabantu”, translating to “I am a person through our people” (Bolden, 2014, Broodryk, 2005, Inyang, 2008, Mbigi, 1997, Van Den Heuvel et al., 2007).

The Ubuntu philosophy is composed of 8 basic principles, namely (Broodryk, 2005):

1. **Compassion** – Humanness, human rights, humanity, spontaneity, friendliness and helpfulness
2. **Forgiveness** – Understanding and consideration
3. **Responsibility** – Respect, obedience, giving unconditionally and sharing
4. **Honesty** – Good versus bad, norms and openhanded-ness
5. **Self-control** – Order, dignity, informality, redistribution and spirituality
6. **Caring** – Sympathy, appreciation and empathy
7. **Love** – Kindness, charity, tolerance and peace
8. **Perseverance** – Strength, commitment and cohesion

The nature of Ubuntu has become popular, such that it has been endorsed by leaders such as Nelson Mandela, Desmond Tutu and Richard Branson (Broodryk, 2005, Hailey, 2008).

2.3.2. Ubuntu – Management philosophy

Once the Ubuntu philosophy was formally documented in the 1990s, it became evident that South Africa may inspire new forms of management and offer new value to the world (Karsten and Illa, 2005b, Micklethwait and Wooldridge, 1996):

“South Africa has made a contribution with the rise of something called ‘Ubuntu’ management which tries to blend ideas with African traditions as tribal loyalty.”

Johann Broodryk was the first person to receive a PhD in Ubuntu during the early 2000s. In his book, *Ubuntu management philosophy*, the essence of the Ubuntu philosophy is detailed along with guidelines on the application for management philosophy in modern business (Broodryk, 2005). A few years before this, Lovemore Mbigi discussed how organisations can embody the Ubuntu philosophy in his book titled *Ubuntu: The African dream in management* (Mbigi, 1997). When drawing comparisons between the work of Broodryk and Mbigi, the authors provide a South

African and Zimbabwean perspective on Ubuntu respectively. For the purposes of this research, the novel contributions of Broodryk will serve as the basis of Ubuntu management, due to the South African focus.

As previously discussed, the Ubuntu management philosophy is still in its early stages of being formally documented. While several authors introduce the principles in different terms, the core meaning, and teaching remains the same. These authors concur that Ubuntu is dedicated to being people focused, with strong values in teamwork, honesty, loyalty, collective decision making, shared vision and respect within an organisation (Broodryk, 2005, Karsten and Illa, 2005b, Malunga, 2006, Matolino and Kwindigwi, 2013, Msila, 2015, Van Den Heuvel et al., 2007, Van Heerden, 1998, Kelly, 2018).

In order to best explain the Ubuntu management principles, Vuyisile Msila's categorisation will be utilised as it provides significantly more detail as compared to other authors. The Ubuntu management principles are presented in table 2 (Msila, 2015). The principles showcased in table 2 are further explained and elaborated on in chapter 5 (the research paper on interviews with Ubuntu experts).

Table 2: Ubuntu management principles (Adapted from Msila, 2015))

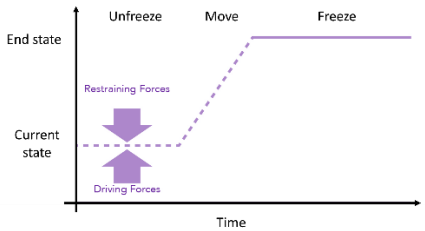
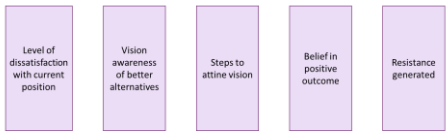
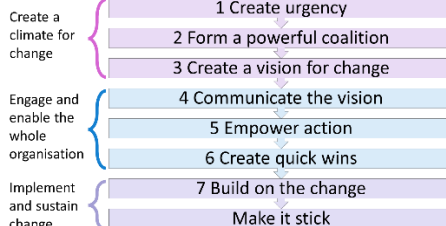
Section	Principles
I - People centredness	1- People centred work culture - Community, solidarity, commitment
	2 - Empowering people - Team leadership and shared responsibility
	3 - Transformational leadership - Inspire, motivate, influence, support
	4 - Mentoring - supportive environment
	5 - Shared vision - goal directed
II - Permeable walls	6 - Openness and honesty - supporting relationships and communication
III - Partisanship	7 - Loyalty to the organisation
IV - Progeny	8 - Collective decision making
	9 - Sharing power and Teamwork
V - Productivity	10 - Continuous employee support and development
	11 - An effective team is a team with the right tools
	12 - Strong organisational value
	13 - Rewarding employees for application of the "right culture"

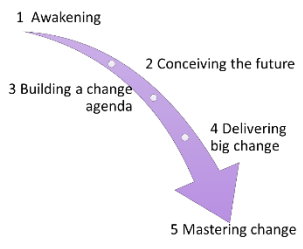
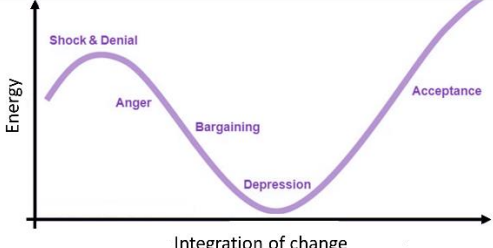
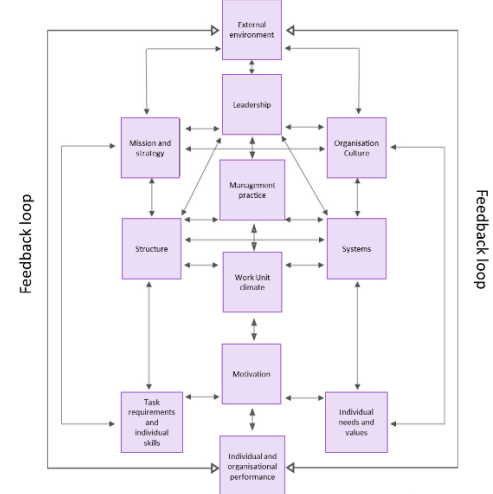
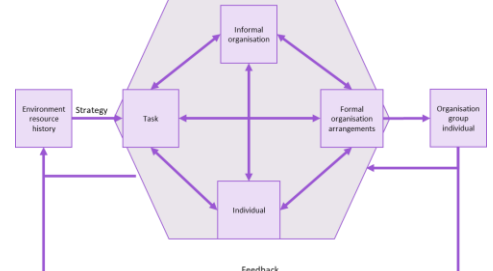
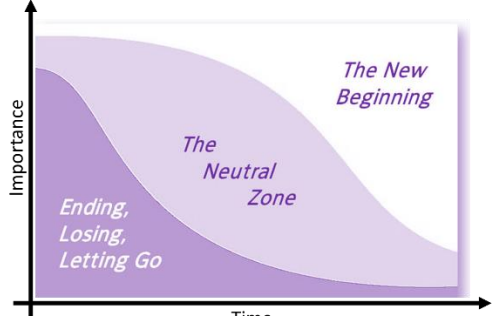
2.4. Change models

Change management is an essential part of growth and development in any industry. Moran and Brightman (2001) described change management as: “the process of continually renewing an organization’s direction, structure, and capabilities to serve the ever-changing needs of external and internal customers”. Based on this, Todnem (2005) concluded that change is an ever-present element that affects all organisations that seek to improve, and that ensuring space and consideration for change is a highly needed skill for any organisation’s transformation.

As previously mentioned, Lean is an organisational cultural change, as opposed to a toolbox or technical matter. Therefore, it is imperative to consider change models when implementing Lean. Due to this, the planned organisational change models (POCMs) explored by Rosenbaum et al. (2018) are discussed in table 3. Table 3 compares the defining characteristics and provides an overview of each POCM as explored by (Rosenbaum et al., 2018).

Table 3: Planned organisational change models (Adapted from Rosenbaum et al. (2018))

POCM	Defining characteristics	Model overview
Lewin’s 3-step model (Lewin, 1947)	Change is viewed as a process of movement from the current stage to the end stage.	
Bullock and Batten’s Phases of planned change (Bullock and Batten, 1985)	From a project management platform, change is seen from technical viewpoint in 4 phases.	
Beckhard and Harris’ change formula (Beckhard and Harris, 1977)	Utilising a formula as an approach to identify the elements of change and how these relate to one another.	D x V x S x B >> R 
Kotter’s Eight-step model (Kotter, 1996)	A procedural approach to managing the process of changed, which is based on lessons learned from 100 organisations.	

Taffinder's Five-step corporate transformational model (Taffinder, 1999)	In a similar vein to Kotter, a procedural approach to transformational change based on lessons learned from 30 organisations.	
Kubler-Ross change curve (Oken, 1969)	Based on people reacting emotionally to change in a similar way to the emotional reaction to grief.	
Burke and Litwin's Causal model (Burke and Litwin, 1992)	It takes the different drivers of change into consideration and ranks them for integrated change.	
Nadler and Tushman's Congruence model (Nadler et al., 1997)	A model that links organisational sub-systems with external environmental changes.	
Bridges' Transitional phase model (Bridges, 1991)	It has a focus on the end-state and moving beyond that from the current state.	

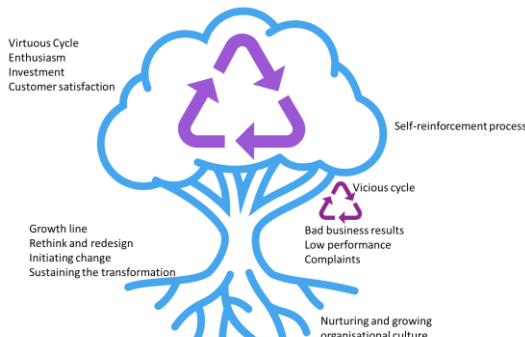
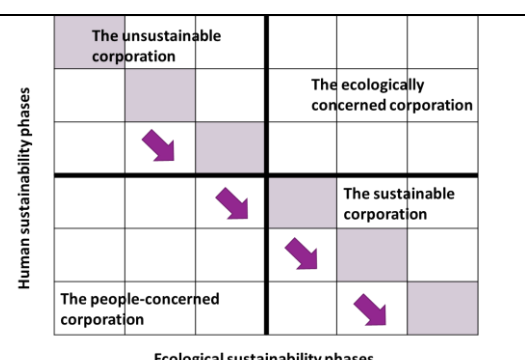
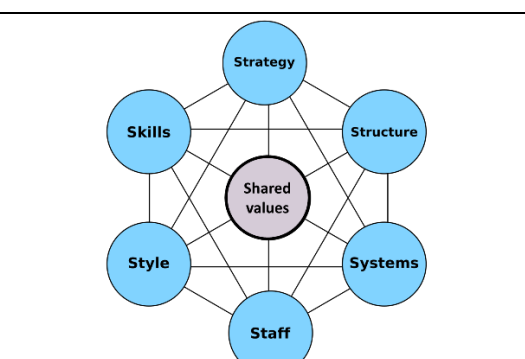
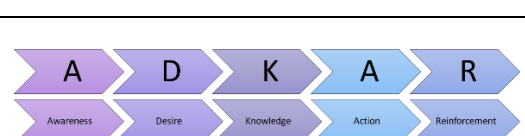
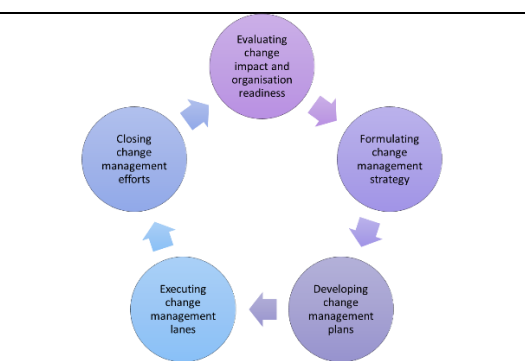
Carnall's Management of transition model (Carnall, 2007)	Has a key focus on organisational management aspects in the context of skills development.	
Senge et al Systemic model (Senge et al., 1999)	It has a large focus on the long-term sustainability issues and the renewal process of change itself.	
Dunphy et al. Sustainability change matrix (Benn et al., 2014)	A six-phase process leading to organisational sustainability.	
Peters and Waterman's 7-S model (Waterman and Peters, 1982)	It assesses how well an organisation was positioned with a range of "soft" and "hard" skill.	
Prosci Ltd ADKAR (Rosenbaum et al., 2018)	A tool that maps a range of enablers of change to a list of management activities.	
Association of Change Management Professionals (ACMP) (Rosenbaum et al., 2018)	A structured method for transitioning to an end state utilising a range of tools.	

Table 3 showcases the different change models and their defining characteristics. Some change models are designed and best suited for large scale projects or micro changes within an organisation. For Lean implementations, Kotter's eight step model would be best suited as it has a procedural approach to managing the change process, this is further explored in chapter 7

2.5. Methodologies

This section explores the various methods utilised through this study.

2.5.1. Design Science Research (DSR)

Design Science Research (DSR) is a research paradigm that stems from information systems (IT) design, while being rooted in the fields of engineering and science (Hevner et al., 2004). Mainly, it is focused on problem solving, via the pursuit of innovative creation of artefacts that enhance human knowledge (Hevner et al., 2004). According to Mwilu et al. (2016), there are four distinguishable artefact types within DSR specifically (Mwilu et al., 2016, Hevner et al., 2004):

- **Constructs** – Language for defining and communicating problems and solutions
- **Models** – Representation for real world situations for better understanding
- **Methods** – Provide guidance on solving problems by defining processes
- **Instantiations** – Demonstrate the implementation of constructs, models and methods, as a functioning system

The DSR paradigm depicts the understanding, executing and evaluation of system research by incorporating behavioural and design science paradigms (Hevner et al., 2004). Practically, this considers the environment of the research and the knowledge base it will contribute to, as illustrated in figure 9.

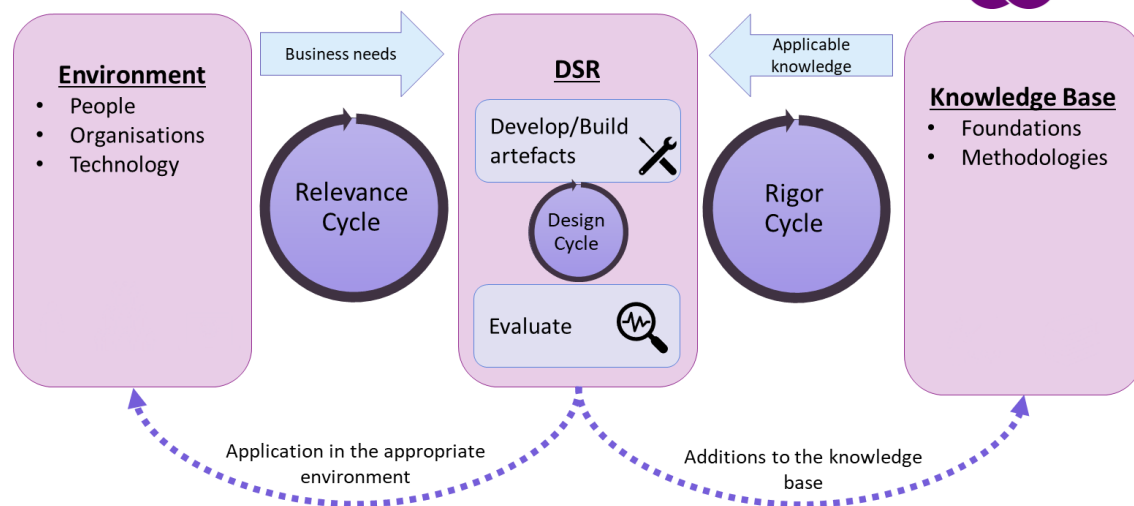


Figure 9: Framework for DSR (Adapted from Hevner et al. (2004))

In figure 9, the three cycles within DSR can be described as (Hevner et al., 2004, Coetzee, 2018, Mangaroo-Pillay, 2020):

- **Relevance cycle** – Allowing one to connect the research (within the design science activities) to the application domain environment.
- **Design cycle** – Allowing one to evaluate the artefact continuously and iteratively whilst developing and building it.
- **Rigor cycle** – Allowing one to base the research (within the design science activities) on existing knowledge and literature.

The foundation of DSR is derived from the knowledge and understanding of a design problem, as well as the solution developed in building and applying an artefact (Hevner et al., 2004). This process is guided by 7 principles as discussed in table 4.

Table 4: DSR Guidelines (Adapted from Hevner et al. (2004))

Guidelines	Description
1: Design as an artefact	DSR must create a viable artefact in one of the forms (construct, model, method or instantiation)
2: Problem relevance	The objective of DSR is to develop technology-based solutions to critical and appropriate business problems
3: Design evaluation	The utility, quality and efficacy of the artefact must be meticulously displayed via well-executed assessment methods
4: Research contributions	Effective DSR must give a clear and verifiable contribution in the areas the artefact, design foundations and/or design methodologies
5: Research rigor	DSR relies on the use of rigorous methods during the construction and evaluation of the artefact
6: Design as a search process	The quest for an effective artefact requires using the available means to reach desired ends, whilst satisfying laws in the problem situation
7: Communication of research	DSR must be presented effectively to technology-oriented and management-oriented audiences

2.5.2. Action Design Research (ADR)

In line with Sein et al. (2011), action design research (ADR) is a research method for creating design knowledge via building and evaluating artefacts in organisations. It is further explained that ADR exists within the DSR paradigm (Sein et al., 2011).

The significance of ADR lies in its ability to deal with two supposedly different issues (Sein et al., 2011):

1. Addressing the problem circumstances encountered in the organisational context
2. The construction and evaluation of the artefact that addresses the problem

Ergo, it permits the building, intervention and evaluation of the artefact, which reflects theoretical creators, researchers' intentions and users' contextual influence (Sein et al., 2011, Coetzee, 2018). In figure 10, the ADR method can be observed to consist of four stages with seven principles in total.

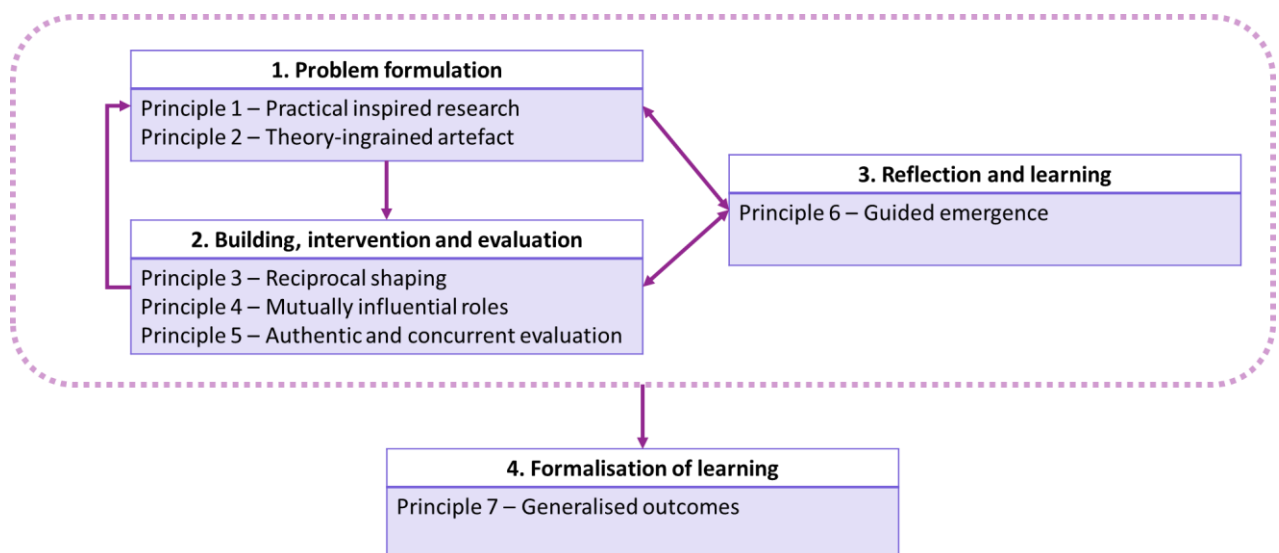


Figure 10: ADR stages and principles (Adapted from Sein et al. (2011))

Stage 1 – Problem formulation

This stage is prompted by the perception of a problem in industry or the prediction of a problem by academics (Sein et al., 2011, Coetzee, 2018, Mangaroo-Pillay, 2020). The following two principles fall within this stage:

- **Principle 1 – Practice-inspired research** – It is important to look at industry or field problems as knowledge creation opportunities

- **Principle 2 – Theory-ingrained artefact** – The development and evaluation of ADR artefacts must be based on theory

Stage 2 – Building, intervention and evaluation

Stage 2 makes use of stage 1 and theoretical grounds as a catalyst for the development of the initial artefact design (Sein et al., 2011, Coetzee, 2018). Moreover, this stage integrates building the artefact, intervention of the organisation and evaluation of the interlinks (Sein et al., 2011, Coetzee, 2018). The following three principles fall within this stage:

- **Principle 3 – Reciprocal shaping** - The two domains (artefact and organisation setting) should be virtually inseparable
- **Principle 4 – Mutually influential roles** - It is imperative that interdependent learning occurs amongst the various project participants by sharing knowledge with each other
- **Principle 5 – Authentic and concurrent evaluation** - Evaluation should be integral to the building stage as opposed to being conducted separately

Stage 3 – Reflection and Learning

This stage moves abstractly from developing a solution for a specific time to application of the teachings to a broader category of problems (Sein et al., 2011, Coetzee, 2018). Additionally, it is important to note that this stage occurs in parallel to stages 1 and 2. The following principle falls within this stage:

- **Principle 6 – Guided emergence** - The collective artefact should embody the initial design by the researchers and its continuous sculpting from organisational use, perspectives and participants

Stage 4 – Formalisation of Learning

The fourth stage entails the defining of accomplishments and the description of organisational outcomes in order to formalise learning (Sein et al., 2011, Coetzee, 2018). The following principle fall within this stage:

- **Principle 7 – Generalised outcomes** - By including the organisational changes that occurred during implementation, one is able to generalise outcomes. Thus, as explained by Coetzee (2018) one should “move from the specific-and-unique to the generic-and-abstract.”

2.5.3. Elaborated Action Design Research (eADR)

Considering that for research, the ADR method is suggested to only have a single entry point for DSR with existing artefacts, Mullarkey and Hevner (2015) proposed the elaborated Action Design Research (eADR) method with multiple DSR entry points that do not assume the existence of an initial artefact.

In their 2015 publication, the proposed eADR method incorporated the stages of ADR (“Problem Formulation”, “Building, Intervention and Evaluation” and “Reflection and Learning”) into an iterative cycle (Mullarkey and Hevner, 2015). It was noted that eADR made improvement on its predecessor (ADR) namely (Mullarkey and Hevner, 2015):

- It no longer assumed the existence of an artefact. Therefore, an earlier DSR entry point is required for the researcher to identify theory and verify the need for an innovative artefact.
- The problem formulation stage of ADR was split into two different stages in eADR (Problem diagnosing and Concept design)
- There are separate stages for building and implementation of the design in eADR.
- The incorporation of intervention and evaluation at every stage of eADR, as opposed to only in stage 2 of ADR.
- The incorporation of reflection and understanding in every stage of eADR in the form of evaluations. Ergo, each stage incorporates intervention, evaluation and learning activities for the enlightenment of both academics and industry.

An overview of the eADR method from the 2015 study is presented in figure 11. It showcases the four stages of eADR and the different DSR entry points. It is important to note, that Mullarkey and Hevner (2015) believe that eADR will be effective if the DSR paradigm is entered at its earliest point (Mullarkey & Hevner, 2015).

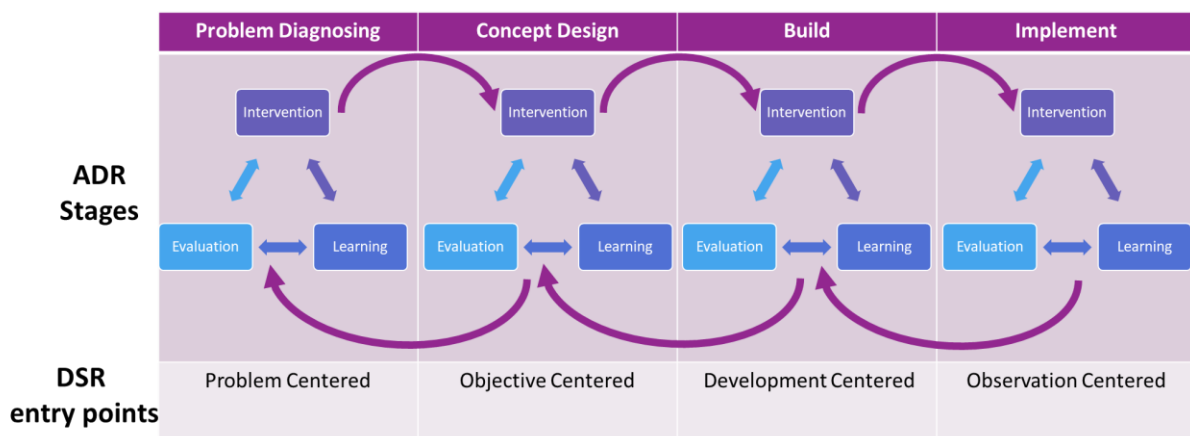


Figure 11: eADR process model (Adapted from Mullarkey and Hevner (2015))

However, in 2019 the creators of eADR proposed an updated approach to the method (Mullarkey and Hevner, 2019). The latest version of eADR takes into consideration the action planning around problem formulation and specific artefact creation during the intervention of each stage of eADR (Mullarkey and Hevner, 2019). Furthermore, reflection is formally added to each stage to ensure enlightenment of both academics and industry (Mullarkey and Hevner, 2019).

In recent research, Mullarkey and Hevner (2019) realised that researcher interventions start with a thorough investigation and diagnosis of an issue or problem and therefore the first stage of eADR is changed to **Diagnosing** (from problem diagnosing in 2015). It is noted that the artefacts built and evaluated during the diagnosing stage may be requirements definitions, technical specifications, and conceptualisations of the problem and solution domains (Mullarkey and Hevner, 2019).

The second stage of eADR is created to have a focus on the identification and conceptualisation of the proposed artefact design, thus, it has been dubbed the **Design** stage (as opposed to concept design in 2015) (Mullarkey and Hevner, 2019). During this stage, many iterations may be utilised as the problem solution evolves over time during the research project, therefore the concept design from 2015 was no longer fitting (Mullarkey and Hevner, 2019). Common artefacts during this stage may include design principles, design features, models, architectures, and implementation methods (Mullarkey and Hevner, 2019).

The third stage of eADR is **Implementation** (as opposed to build in 2015) due to the need for physically deploying the designed main artefacts at the client organisation (Mullarkey and Hevner, 2019). During this stage, various artefacts may be produced like systems, algorithms, programmes, databases, and processes (Mullarkey and Hevner, 2019).

The fourth stage of eADR has become **Evolution** (as opposed to implement in 2015), due to the main artefact evolving over time as the problem environment grows and changes (Mullarkey and Hevner, 2019). This stage may be long-term organisation change as improvements are made. An overview of the eADR method from the 2019 study is presented in figure 12. It showcases the four stages of eADR and the different entry points. The adaption of this methodology as the overarching research design for this study is captured in chapter 3.

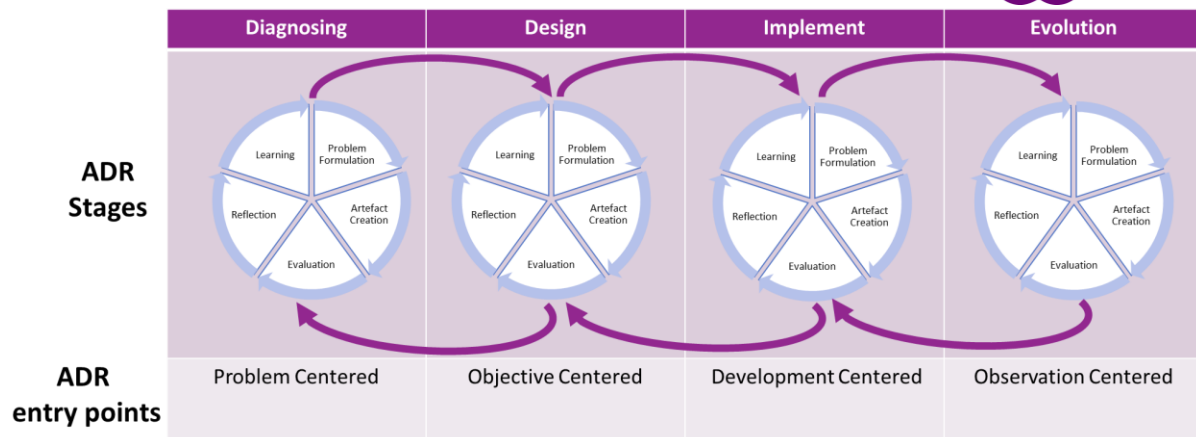


Figure 12: Update eADR process model (Adapted from Mullarkey and Hevner (2019))

2.5.4. Systematic Literature Reviews (SLR)

A systematic literature review (SLR) is a specific research question based literature review that allows for the location, appraisal and synthesis of the best available evidence or studies (Boland et al., 2017). More specifically, Boland et al. (2017) explains that the purpose of an SLR is to provide information and evidence-based answers to the posed research questions. While, Booth et al. (2012) expresses that an SLR is a reproducible, systematic and explicit method for the identification, evaluation and synthesis of present literature and work of academics and practitioners (Booth et al., 2012).

The results that are produced from an SLR may be a path to advancements within a field or a combination of information with qualified judgement to permit justified decision making (Booth et al., 2012). There are various types of SLRs, each with a unique purpose (Xiao and Watson, 2019). Figure 13 provides a high level overview of the types as captured by Xiao and Watson (2019) and Mangaroo-Pillay (2020).

It is essential to understand what a study wants to achieve prior to selecting the type of SLR that will be followed (Boland et al., 2017). In chapter 1, the following two objectives were discussed:

- Investigate and prove that there is no culture-specific South African Lean implementation framework (expanded on in chapter 4)
- Investigate Lean framework development (in terms of literature, methods, design requirements and testing) (expanded on in chapter 6)

Based on these, a scoping SLR is best suited in order to achieve both objectives, as it allows for the identification of conceptual boundaries and explores types of evidence and research gaps (Xiao and Watson, 2019).

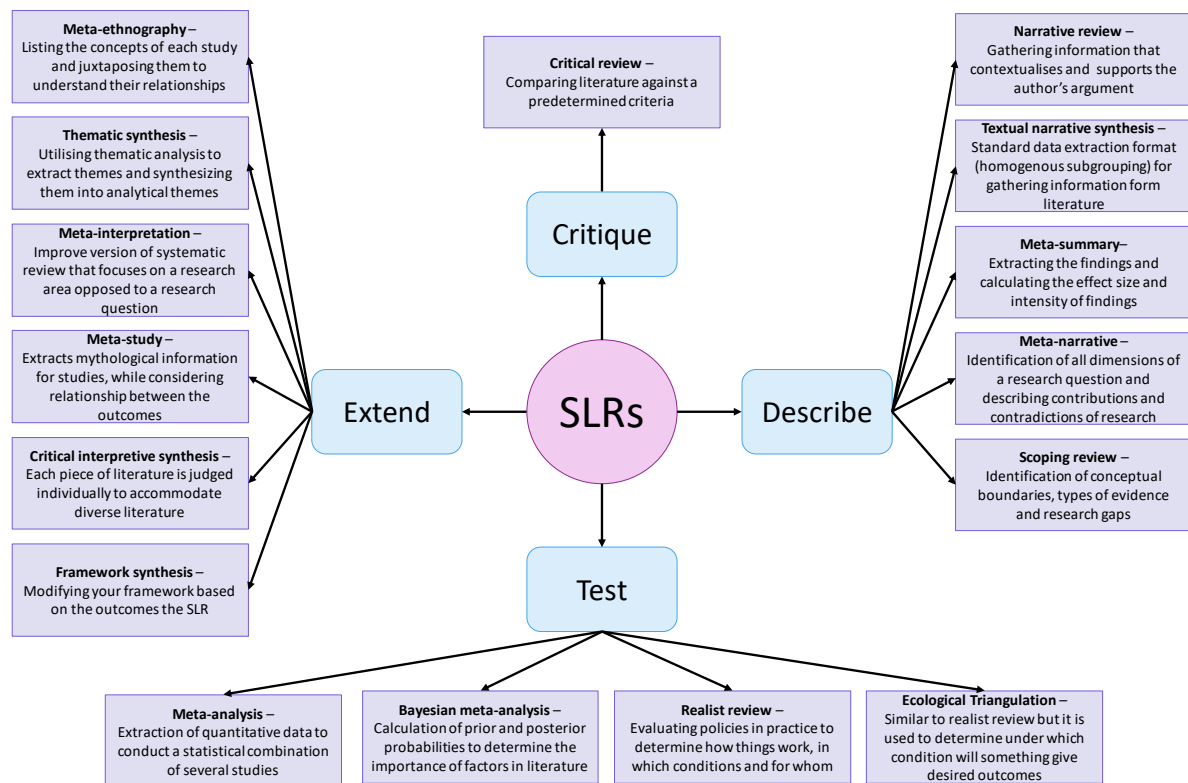


Figure 13: Types of systematic literature reviews (Adapted from Mangaroo-Pillay (2020) and Xiao and Watson (2019))

2.5.5. Interviews

In qualitative research, interviewing is the prime mode of data collection (DePoy and Gilson, 2012, De Vos et al., 2011a, Creswell and Creswell, 2017). In the most basic sense, interviews are a direct interchange between researchers and participants in order to obtain the knowledge they seek (De Vos et al., 2011a, DePoy and Gilson, 2012). Unlike other data collection methods, during interviews, researchers are deeply and unavoidably involved in generating meaning that presumably resides with participants, due to the interactional nature of interviews (De Vos et al., 2011a). It is imperative that a researcher approaches interviews within the correct guidelines, as if done incorrectly, interviews will generate poor outcomes (De Vos et al., 2011a). Simply, the correct questions must be asked in the correct way to optimise the type and quality of data collected.

In order to ensure effective interviews, researchers suggest the following guideline (De Vos et al., 2011a, Jarbandhan and Schutte, 2006):

- Ensure that participants do 90% of the talking
- Questions must be clear and brief
- Questions must be asked one at a time
- Questions should be open-ended, unless differently required
- Avoid sensitive questions, unless within the scope of the study
- Begin with no controversial questions
- “Funnel” questions, starting with generic then specific
- Avoid leading questions
- Encourage free rein but maintain control of the interview
- Allow for pauses in conversation if required
- Return to incomplete points or questions
- Conclude an interview with a general question
- Do not interrupt a participant, unless required
- Follow up on hunches and what participants say
- Monitor the effects of the interview on the participants, provide closure counselling if needed
- Do not switch off the tape recorder
- Keep track of the length of the interview
- If the participant strays of topic, try to pull them back as soon as possible.

Interviews also require an array of communication techniques or skills, like minimal verbal response, paraphrasing, clarification, reflection, encouragement, commentary, spurring, reflective summary, listening, probing, understanding, acknowledgement and procurement of details (De Vos et al., 2011a, Creswell and Creswell, 2017, Holstein and Gubrium, 1995). Creswell and Creswell (2017) recommend the use of an interview protocol to aid in combating the overwhelming task of the physical interview. This protocol can act as a guide for a researcher during the process. Table 5 illustrates an interview protocol.

Table 5: Interview protocol (Adapted from Creswell and Creswell (2017))

Interview protocol for xxx		
Basic information – Record keeping information like date		
Introduction – Research introduces and explains the study and themselves. Discuss the logistics of the interview		
Guiding research question – This is the main goal of the interview		
Research question 1 Capture question	Research question 2 Capture question	Research question xx Capture question
Interview question Rephrase question based on target audience - Add probing question 1 - Add probing question 2 - Add probing question x	Interview question Rephrase question based on target audience - Add probing question 1 - Add probing question 2 - Add probing question x	Interview question Rephrase question based on target audience - Add probing question 1 - Add probing question 2 - Add probing question x
Closing instruction – Thanking the participant, assuring confidentiality, asking for follow ups		

Interviews are utilised and further discussed in chapter 5.

2.5.6. Thematic Analysis

Thematic analysis is a method for systematically identifying and organising data, while analysing the patterns and themes that are present in a data set (Braun and Clarke, 2012, Guest et al., 2011). Braun and Clarke (2012) explain that there are two main reasons to utilise thematic analysis, the accessibility to new methods and the flexibility it offers new qualitative researchers.

This analysis method allows researchers to take apart interview transcripts or other written data to highlight patterns that converge or diverge. This also allows researchers to determine if data is saturating or not (Guest et al., 2011). This is expanded on and utilised in chapter 5. According to Braun and Clarke (2012), the six-phase approach to thematic analysis can be summarised as:

1. Phase 1: Familiarising yourself with the data
2. Phase 2: Generating initial codes
3. Phase 3: Searching for themes
4. Phase 4: Reviewing potential themes
5. Phase 5: Defining and naming themes
6. Phase 6: Producing the report

2.5.7. Surveys

Surveys assist in investigating and studying the trends, attitudes and opinions of a population by means of a sample that is represented numerically (Creswell and Creswell, 2017). Sinkowitz-Cochran (2013) concurs that surveys serve as an efficient way to obtain rich data and answers to numerous questions. Furthermore, it is believed to be the most common form of measurement that ensures that data collection is represented in a standard form (Sinkowitz-Cochran, 2013, Kelley et al., 2003).

Much like any method or form of measurement, surveys present various benefits and drawbacks. According to Kelley et al. (2003), the advantages and disadvantages of surveys need to be carefully understood during any stage of the research. The strength of surveys is its ability to provide generalised opinions of a specific population based on the breadth of coverage belonging to the sample. Moreover, real-world observations can be made off this form of empirical data. Surveys facilitate the cost-effective data collection of large sets of data in a reasonably short period of time. In contrast, an argument against surveys is the researcher can mistakenly perform a shallow analysis of the data and provide weak arguments. Surveys can also lead to researchers misconstruing the significance of findings that are misguided by the majority of coverage from the sample. On a more practical level, survey response rates can be difficult to guarantee.

Two distinct branches of surveys have emerged, namely (OECD, 2012):

- **Interviewer-administered** - surveys involving questions posed by the researcher to participants
- **Self-administered** - surveys completed solely by the participant, as provided by the researcher. Within this branch, four types exist:
 1. Group administration
 2. Mail procedures
 3. Dropping off at participant
 4. Internet surveys

Each type can offer value to the research. However, internet surveys return the highest cost benefit and participants may engage with this at their convenience, thereby qualifying this with the highest potential (OECD, 2012). The use of internet surveys is depicted in chapter 8.

Undoubtedly, the most crucial factor in surveying is to minimise measurement errors and consider ethical implications (Bryman and Bell, 2016, Creswell and Creswell, 2017, De Vos et al., 2011b, Fanning, 2005, Kelley et al., 2003, OECD, 2012, Sinkowitz-Cochran, 2013). These authors all recommend the following with regards to surveys:

- Format of the survey should be uncluttered and well spread
- Instructions should be included
- A thank you message should be included at the end of the survey
- One should make use of a pre-existing scale for responses
- Statements should not be vague or ambiguous
- Statements should not be leading or persuasive
- Statements should not contain unexplained jargon or acronyms
- Statements should be as few as possible
- Statements should as short as possible
- Statements should not double-barrelled
- Grouping should be utilised for compartmentalising statements
- Surveys should maintain anonymity and confidentiality of the participants
- Statements should be composed in simple and basic English, and pitched at the right level
- Each statement should be relevant to the validation and verification process

2.5.8. Surveys Statistics

For the purpose of this thesis, purposive sampling was utilised when selecting participants. Purposive sampling allows for the selection of participants based on the inherent needs of the study (De Vos et al., 2011a). In the case of this thesis, participants were selected for their expert knowledge in Lean or Ubuntu philosophy.

Unlike with probability sampling, there are limited statistical calculations and interpretation that may be done with the data (De Vos et al., 2011a). The use of survey statistics is explored and used in chapter 8. The most basic calculation that may be done for any survey question or statement (that uses the Likert scale) is an average or mean calculation. This may be calculated as (Devore et al., 2013):

$$\bar{x} = \frac{\sum_i^n x_i}{n}$$

Equation 1: Mean

Where $\sum_i^n x_i$ is the sum total of all the scores and n is the number of responses. The mean allows for the interpretation of the group's decision or agreement level on a topic or statement.

Another statistic that may be utilised is the standard deviation of a statement or question. Standard deviation allows one to see the distribution of the participants responses. It also depicts how far the responses are from the group mean. This may be calculated as (Devore et al., 2013):

$$s = \sqrt{s^2} = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

Equation 2: Standard Deviation

Where s is the standard deviation of all the scores, x is the mean of the scores and n is the number of responses.

If the standard deviation is squared, this will result in the variance of the statement or question. Variance measures the average degree to which each point differs from the mean. This may be calculated as (Devore et al., 2013):

$$s^2 = \frac{\sum (x - \bar{x})^2}{n - 1}$$

Equation 3: Variance

Where s is the standard deviation of all the scores, x is the mean of the scores and n is the number of responses.

In order to test the reliability of a multiple-question, Likert-scale survey, Cronbach's alpha statistic may be calculated (Ercan et al., 2007). Cronbach's alpha is widely considered to be the conventional measure for internal consistency and reliability in survey design (Taber, 2018, Ercan et al., 2007). It may be calculated as (Ercan et al., 2007):

$$\alpha = \left(\frac{k}{k-1} \right) \left(\frac{s_y^2 - \sum s_i^2}{s_y^2} \right)$$

Equation 4: Cronbach Alpha

Where α is the Cronbach's alpha statistic, k is the number of questions or survey statements, s_y^2 is the variance total score obtained for each participants scores, and $\sum s_i^2$ is the sum total of the variance obtained for each survey statement.

It is vital to note that the value calculated for α talks to the level of internal consistency and reliability of the survey. The values may be interpreted as depicted in table 6.

Table 6: Internal consistency interpretations of Cronbach's alpha (Vale et al., 1997)

Cronbach Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.7$	Poor
$\alpha < 0.5$	Unacceptable

2.6. Chapter summary

This chapter explored the origins and definitions of Lean management and Ubuntu management. Furthermore, it provided an overview of the various methods utilised in this thesis and concluded on the use or relevance to the study.

CHAPTER 3

Research Design

This chapter discusses the research design of the overarching study.

3.1. Introduction

The overarching research design for this thesis addresses the problem of low Lean implementation success rate in South Africa due to a lack of culture-specific Lean implementation frameworks adapted for the diverse culture of South Africa. Ergo, the aim of this research is to develop a culture-specific, Lean implementation framework for South Africa utilising the Ubuntu management philosophy.

The research paradigm of this study is design science research (DSR) (section 2.5.1), which was selected due to its problem-solving nature with the intention of developing innovative artefacts (Coetzee, 2018, Hevner et al., 2004, Mangaroo-Pillay, 2020). Moreover, inside this DSR paradigm, the action design research (ADR) methodology was utilised (section 2.5.2), allowing for two challenges to be addressed (Sein et al., 2011, Coetzee, 2018):

1. Addressing the problem circumstances encountered in the organisational context
2. Constructing and evaluating the artefact that addresses the problem

Considering that ADR focuses on pre-existing frameworks and that this research aims to design a new framework, it is evident that the ADR will fall short. Therefore, the elaborated action design research (eADR) (section 2.5.3) method will be employed within ADR as it is created for research with no pre-existing frameworks (Coetzee, 2018, Mullarkey and Hevner, 2019). The relationship between the DSR paradigm and the eADR methodology within this study is illustrated with figure 14. Akin to nesting dolls, eADR exists within the ADR methodology, which is within the DSR paradigm.

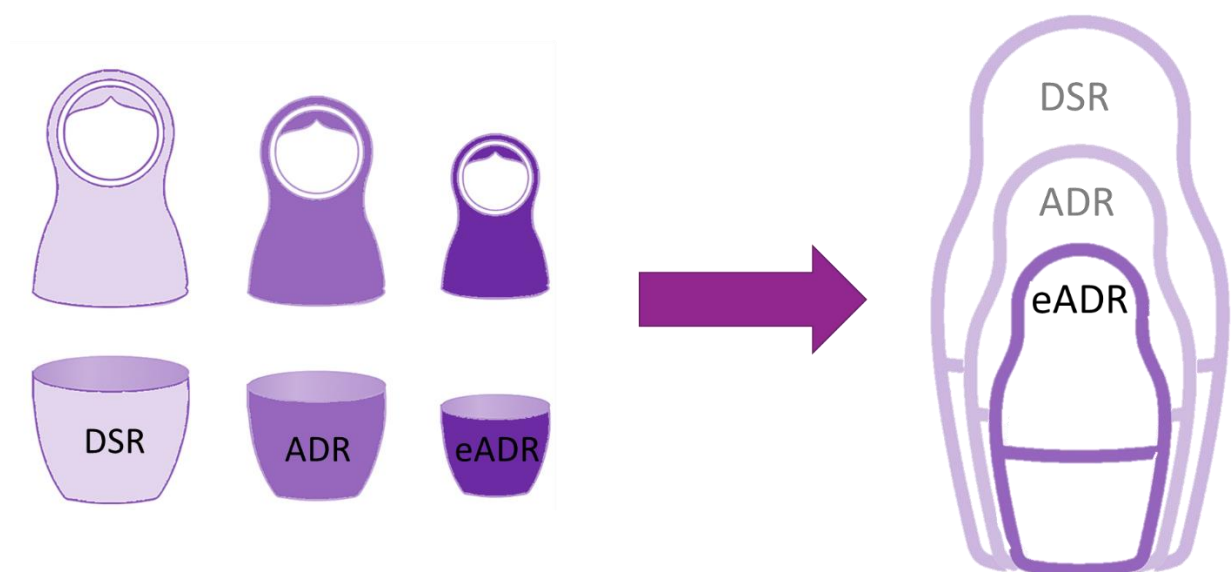


Figure 14: Relationship between eADR, ADR and DSR (nesting doll analogy)

The design of eADR allows a researcher to enter and exit at various stages in the research range (Mullarkey and Hevner, 2019). Based on the aim of this thesis, the research enters at the diagnosing stage as there is a need to explore the research problem before designing an artefact to address it (figure 15).

From figure 15, the overarching research design can be seen, encompassing 4 cycles within eADR. The two stages of eADR that are utilised are diagnosing and design, both of which are indicated with dashed block outlines. Only one cycle was conducted during the diagnosing stage and three cycles were performed in the design stage. The detail of each of these cycles are explained in sections 3.2 to 3.5 that follow.

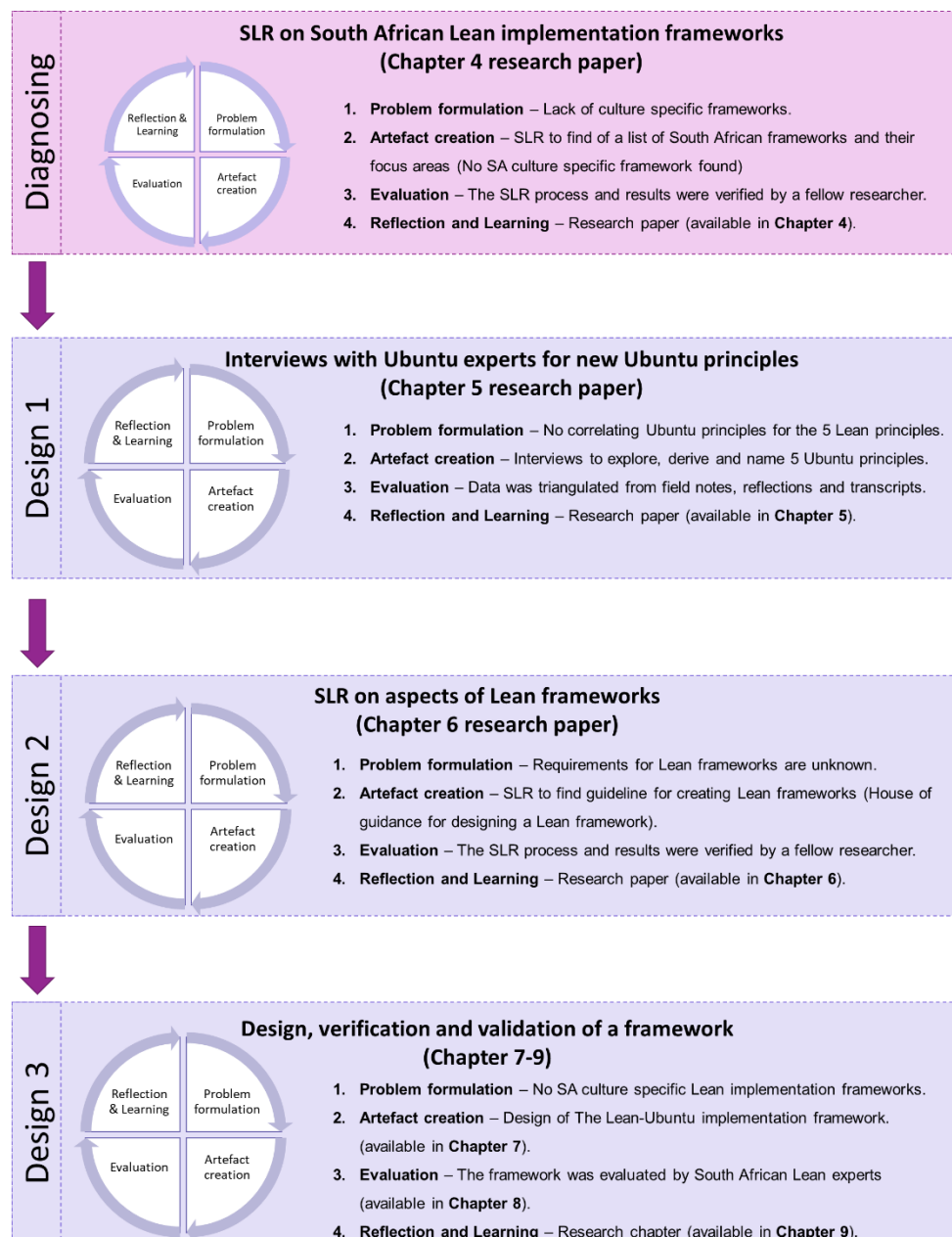


Figure 15: eADR research design

3.2. Diagnosing phase – SLR on South African Lean implementation frameworks

The intent of this stage was to explore the pre-existing Lean frameworks in South Africa and confirm the lack of culture-specific Lean implementation frameworks (thus, proving the research problem). The following points discuss the cycle steps of the diagnosing phase:

1. **Problem formulation** – There is a lack of culture-specific Lean implementation frameworks in South Africa (the research problem from chapter 1).
2. **Artefact creation** – An empirical investigation was conducted via a systematic literature review to analyse existing South African Lean frameworks. An artefact was created in the form of a list of South African frameworks and their focus areas. Therefore, proving a valid research problem as there were no culture-specific Lean implementation frameworks for South Africa.
3. **Evaluation** – The SLR process and results were verified by a fellow researcher.
4. **Reflection and Learning** – The reflection and learning of the diagnosing phase was documented in a research paper (available in **Chapter 4**).

3.3. Design phase 1 - Interviews with Ubuntu experts

The goal of design phase 1 was to explore established Ubuntu common practices and derive Ubuntu management principles that would correlate with the Lean principles that did not have correlating Ubuntu principles from the previous study (Mangaroo-Pillay and Coetzee, 2021). The following points discuss the cycle steps of the design phase 1:

1. **Problem formulation** – There were no correlating Ubuntu principles for the five Lean principles within the process tier of the “4P model of the Toyota way”.
2. **Artefact creation** – Interviews were conducted with Ubuntu experts to explore established common practices and derive Ubuntu management principles from these to correlate with the unmatched Lean principles. This resulted in the naming of five Ubuntu principles that correspond to the process-themed Lean principles.
3. **Evaluation** – Interviews were transcribed verbatim. Thereafter, the data was triangulated from field notes, reflections and transcripts to ensure data richness and accuracy.
4. **Reflection and Learning** – The reflection and learning of design phase 1 was documented in a research paper (available in **Chapter 5**)

3.4. Design phase 2 – SLR on aspects of Lean frameworks

The intention of this phase was the exploration and analysis of available Lean frameworks to determine common design methods and elements amongst them. The following points discuss the cycle steps of the design phase 2:

1. **Problem formulation** – Common factors or requirements for the design of a Lean framework are unknown.
2. **Artefact creation** – An SLR was conducted to explore and analyse existing frameworks. This led to the development of the “House of guidance for designing a Lean framework”, which included the following: 1) guidelines to the applicable literature to consider, 2) design element to include, 3) design methods to consider and 4) methods to test a Lean framework with.
3. **Evaluation** – The SLR process and results were verified by a fellow researcher.
4. **Reflection and Learning** – The reflection and learning of design phase 2 was documented in a research paper (available in **Chapter 6**)

3.5. Design phase 3 – Design of the Lean-Ubuntu implementation framework

The purpose of the last design phase was to create a culture-specific Lean implementation framework for South Africa that utilised the Ubuntu management philosophy. The following points discuss the cycle steps of the design phase 3:

1. **Problem formulation** – Current South African Lean implementation frameworks do not have a culture-specific focus.
2. **Artefact creation** – “The Lean-Ubuntu implementation framework” was designed by utilising the “House of guidance for designing a Lean framework” and incorporated the matching Lean and Ubuntu principles.
3. **Evaluation** – The framework was evaluated by South African Lean experts
4. **Reflection and Learning** - The reflection and learning of design phase 3 was documented in chapter (available in **Chapter 7-9**)

3.7. Chapter summary

This chapter allowed for the breakdown of the relationship of DSR, ADR and eADR to be explored in terms of this study. Furthermore, it showcased the breakdown on the research design.

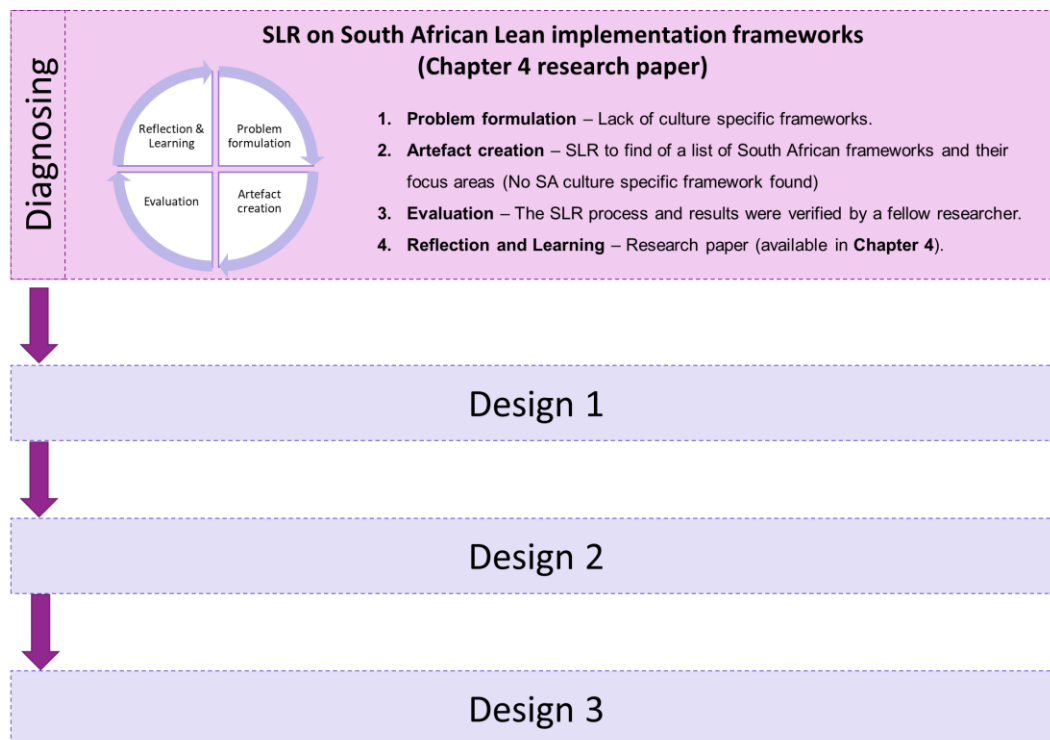
CHAPTER 4

Systematic Literature review on South African Lean frameworks

This chapter contains a research paper that explored South African Lean implementation frameworks using an SLR. This research study found that there were no existing culture-specific Lean implementation frameworks for South Africa, thus validating the research problem.

This research paper formed part of the conference proceedings of the SAIE 32 (Green) conference and can be found at <https://www.saiie.co.za/publications>

The work portrayed in this chapter forms part of the diagnosing phase of the research design, as can be seen in the diagram that follows.



CATEGORISING SOUTH AFRICAN LEAN IMPLEMENTATION FRAMEWORKS: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Although Lean has become a global phenomenon, only about 10% of Lean implementations ventures are successful. Ergo, multiple researchers have designed and created specific Lean implementation frameworks, however there is a level of uncertainty regarding which frameworks exist for which application. Therefore, this research aimed to investigate studies on South African Lean implementation frameworks, by conducting a systematic review on applicable literature. It provides a fulsome synthesis and categorization of available Lean implementation frameworks. Furthermore, it was found that there are various types of frameworks, each with a specific target audience. However, it also highlighted the gaps in current research, such as a lack of culture specific frameworks in South Africa. This systematic literature review could support researchers and practitioners in understanding and selecting the Lean implementation framework that would best suit their needs.

1 KEYWORDS: LEAN, IMPLEMENTATION FRAMEWORKS, SOUTH AFRICA, SYSTEMATIC LITERATURE REVIEW

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1 INTRODUCTION

The Lean philosophy, developed in Japan during the 1930s [1], is a business management philosophy that is used to eradicate wastes and increase profits. Since then it has gained global recognition due to its organisational benefits (i.e. continuous improvements). Although Lean has become a global phenomenon, only about 10% of Lean implementations ventures are successful [2, 3].

Authors [4, 5, 6, 7, 8, 9, 10, 11, 12] have explained that Lean is a cultural change across an organisation, as it necessitates commitment from all levels within an organisation. They have also noted that Lean implementation differs in companies and/or industries, because the companies and industries are unique in structures and standards. Due to this, they explain that Lean requires some degree of customisation, as opposed to just utilising it as a simple toolbox.

Thus, there has always been a need for creating different implementation frameworks, that customise Lean implementations to certain aspects, such as different industries or knowledge areas. However, considering that there are several implementation frameworks available, a level of uncertainty exists regarding which frameworks should be used for which application.

Based on this background, this research paper intends to explore the available Lean implementation frameworks available in the South African context, in order to allow for the categorisation of them in terms of their application.

For purposes of this paper, a Lean implementation framework will be considered as a structured outline or figure, that is used to present actions and tasks that need to be implemented for Lean. Furthermore, it will contain some direction or incrementation of steps that must be followed at different stages or levels. Lean implementation models will not be included in the study since these models usually include optimisation models, which are more mathematical in nature and outside the scope of this study. Additionally, this study will not include Lean implementation roadmaps, as these are strategic tools for a specific project (which are not often reused). On the other hand, frameworks will be the focus, as these usually include practical steps for implementation on an organisational level.

2 RESEARCH METHOD

In order to achieve the aim, a systematic literature review (SLR) was conducted on applicable literature. It took the form of a scoping SLR, with a view to explore the scopes of various studies and the purpose of the designed frameworks within each study [13]. The SLR method utilised in this study was based on the proposed method by Albliwi et. al. [14]. The sequence and grouping of the steps into research phases are illustrated in figure 1, while the detail of each step is as follows:

- **Step 1: Develop a research purpose and/or objective** - Clearly state the goal of the SLR
- **Step 2: Develop research protocol** - Create a research protocol that includes the purpose, inclusion criteria, exclusion criteria, databases, keywords and quality assessment criteria
- **Step 3: Establish relevance criteria** - State the reasoning for if a resource is relevant to this study
- **Step 4: Search and retrieve the literature** - Conduct searches on applicable scientific databases to find literature
- **Step 5: Selection of studies** - Use the inclusion and exclusion criteria to select studies
- **Step 6: Quality assessment for relevant studies** - Assess the quality of each paper
- **Step 7: Data extraction** - Extract relevant information from the papers



- **Step 8: Analysis and synthesis of findings** - Analyse and synthesise the data from the papers in order to find themes and patterns
- **Step 9: Report** - Report the review in detailed results
- **Step 10: Dissemination** - Publish the SLR

The outcomes of step 1- 6 are discussed in the sub-sections to follow, while the findings of the study (step 7 & 8) are documented in section 3. Steps 9 and 10 are addressed by publishing this research paper.

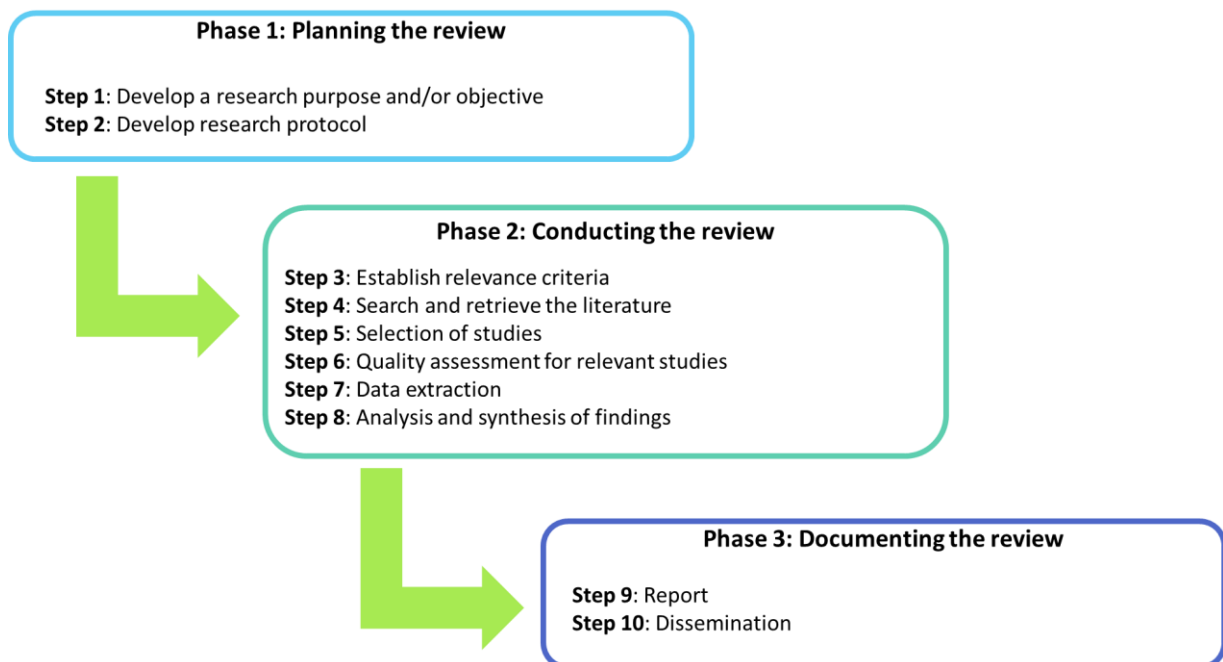


Figure 1 : Research method and phases (Adapted from [14])

The SLR was conducted from February 2020 to June 2020 on the selected databases using the predetermined keywords.

2.1 Step 1: Develop a research purpose and/or objective

The purpose and objective of this research was to investigate the available South African Lean implementation frameworks, in order to allow for the categorisation of said frameworks, according to their purpose or intended application.

2.2 Step 2: Develop research protocol

The research protocol that was developed is captured in table 1. This included the purpose of conducting the study, as to keep the end goal in mind. It also encompassed the inclusion and exclusion criteria, in order to remove researcher bias and increase repeatability of the study. The databases that were selected for this study were based on their incorporation of Industrial engineering themed literature. Key words and quality assessment are included in the research protocol to provide guidance on what to search for and how to assess its quality. Furthermore, the research protocol was validated by a fellow researcher, by means of iterative discussions and deliberations.

Table 1: Research review protocol (Structure adapted from [13])

Purpose of the study	To investigate the available literature on South African Lean implementation frameworks and classification or categorisation them
Inclusion Criteria	• Literature that contains “Lean”, “Framework” and “Implementation” in the title, abstract or keywords • Literature based in South Africa
Exclusion Criteria	• Literature referring to weight-loss/obesity • Non-English literature • Literature based in other countries (not SA) • Lean Six Sigma studies
Search Databases	• Science Direct • Scopus • IEEE Explore • Web of Science • EBSCOhost (Academic search premier, Business source premier, E-journals, MasterFILE premier) • Emerald Insight Journals • Google Scholar
Keywords	“Lean” AND “implementation framework” AND “South Africa”
Quality assessment criteria	• All duplicate literature must be removed • Recovered literature was checked for relevance • Evaluate based on their correct understanding and interpretation of Lean

2.3 Step 3: Establish relevance criteria

When establishing the relevance criteria, it was important to be specific, yet leave room for as many studies to be included as possible [13, 14]. Therefore, the following relevance criteria was developed by which studies were included:

- Literature that contained “Lean”, “Framework” and “Implementation” in the title, keywords or abstract of the study
- Studies and frameworks that are based in or created for South Africa
- Creates and discusses a new framework for Lean implementation

2.4 Step 4: Search and retrieve the literature

The search and retrieving of the literature was initially done by using the databases stated in section 2.2. This yielded 1425 studies, of which 9 met the inclusion criteria. The huge yield was due to databases producing Lean articles that referred to other Lean frameworks (not included in their studies itself) and some frameworks that were not based in South Africa, but mentioned “South Africa” in their paper.



However, after the initial search, it was revealed that some duplicates existed in the 9 selected studies. Ergo, there was a need to conduct a secondary search on different databases.

The secondary search was conducted on the repository websites of universities in South Africa that have Industrial Engineering programs. These repositories include each university's PhD thesis, Masters dissertations, final year projects reports and other major reports. While it is unorthodox to use repositories for an SLR, it was select for the secondary searchers due to its richness in data. This yielded 11 229, of which only 7 additional studies were found that met the inclusion criteria. The large number of papers yielded during the secondary search (11 229) was attributed to the fact that the search function of many repository websites include all studies that contain the search terms (anywhere in the full text), and not just those that have the search terms in their titles or abstracts. The search and retrieval process that was followed, is documented in the "Identification" section of figure 2.

2.5 Step 5: Selection of studies

Once all studies were screened based on step 1's protocol, 16 studies were selected (9 from the initial search and 7 from the secondary search). Again, these studies were evaluated, in order to remove all duplicates, resulting in 8 studies being eligible for inclusion. The outcome of the selection process is captured in the "Screening" and "Eligibility" sections of figure 2, illustrating both the initial and secondary search results per database.

After selecting the studies, information of each study was captured, such as the names of authors, title of studies and year of publication (table 2).

2.6 Step 6: Quality assessment for relevant studies

After all duplicates were removed, the quality of the studies were assessed by reading the full texts. Papers were assessed based on their correct understanding and interpretation of Lean. It was found that all 8 papers were acceptable for inclusion.

Step 4 through to 6 of the selection process, as discussed in section 2.4 - 2.6, is captured in figure 2. It illustrates the different phases of the search at the left of the figure, as well as differentiates between the amount of studies found and selected from each database.



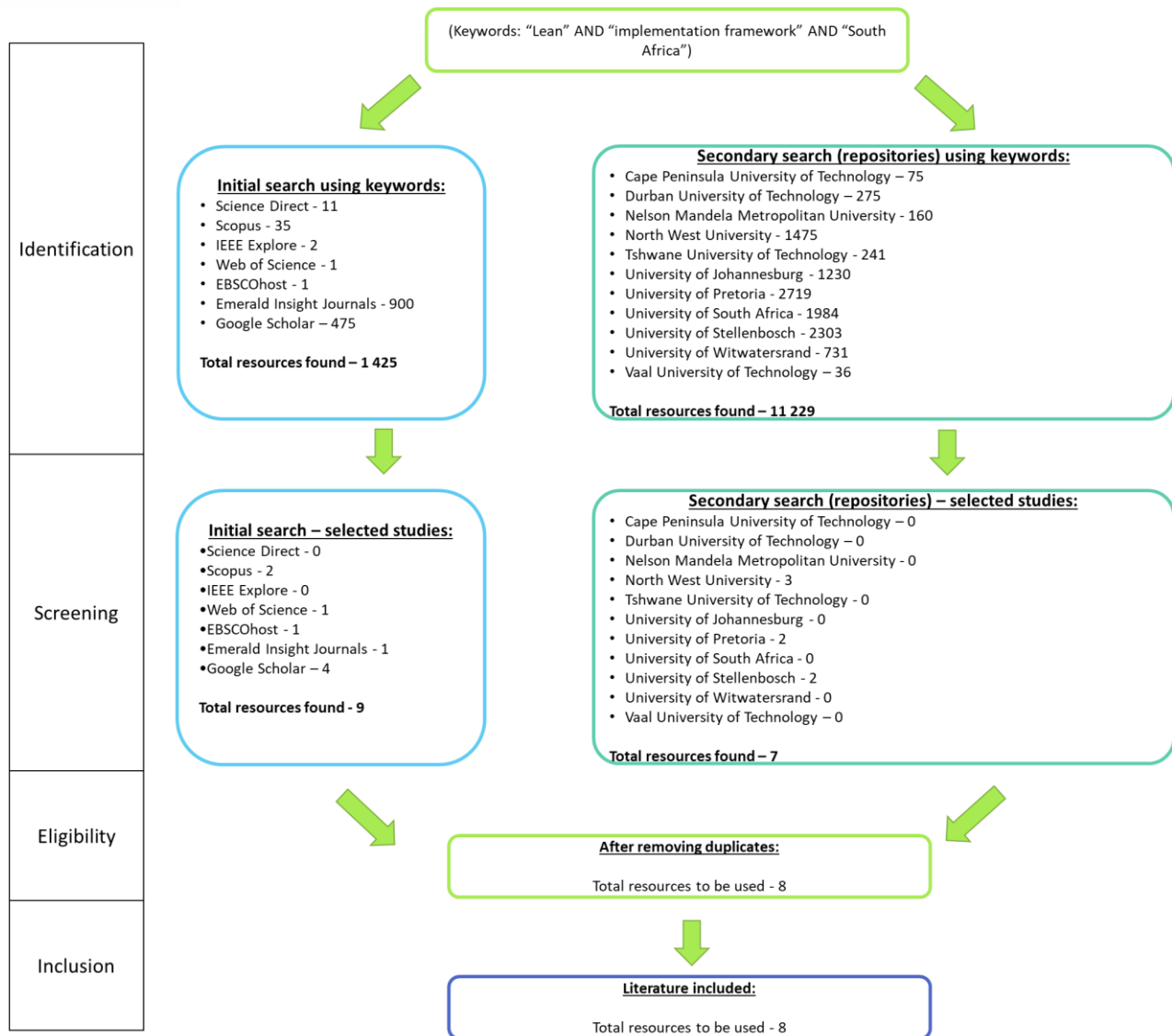


Figure 2: Selection process chart

3 FINDINGS

The findings (step 7 and 8) from following the aforementioned SLR methodology are discussed in the following sub-sections.

3.1 Step 7: Data extraction

Upon finalising the list of studies to be included and studying their full texts, a summary was developed explaining the Lean frameworks that were created in each study (Table 2). The summaries included (1) the knowledge areas that the implementation frameworks were created for, (2) a summary of elements (e.g. objects or tools), (3) the framework structure (e.g. cyclical or linear), (4) the research discipline the work was published in and (5) the type of study (Masters or Doctoral). Table 2 captures this information together with the author(s) details, year of publication and study title.



Table 2: Data extracted from applicable literature

#	Author(s)	Year	Research Title	Knowledge Area	Summary of elements	Framework structure	Discipline	Study type	Ref
1	I Maradzano, RA Dondofema & S Matope	2019	Application of lean principles in the South African construction industry	Construction	Lean implementation framework for construction. It contains phases, objective and tools for each step of the framework.	Cyclical	Industrial Engineering	Masters	[15]
2	R Coetzee	2019	Development of the Respect for People model for lean implementation in the South African context	Respect for people	Lean implementation framework that incorporates respect for people. It contains phases, value streams, organisational levels, respect for people themes and steps.	Cyclical	Industrial Engineering	PhD	[16]
3	K Sekoto	2019	A lean management framework for orthopedic operating theatres of a level three public hospital, North West Province	Scheduling in health care	Lean implementation framework for scheduling in an orthopedic theatre. It contains stages and objectives.	Cyclical	Business	MBA	[17]
4	E Zeelie	2019	A lean project management framework for additive manufacturing	Additive manufacturing project management	Lean implementation framework for project management in additive manufacturing. It contains knowledge areas and groups for the various stages of project planning.	Cyclical	Engineering management	Masters	[18]



5	JM de Villiers	2018	A Framework for Implementing Lean Practices and Tools to support ISO 55000 Compliance for Physical Asset Management	ISO 55000 compliance for asset management	Lean implementation framework to support ISO 55000 compliance. It contains Lean tools for ISO standards, in different aspects of asset management.	Cyclical	Engineering management	Masters	[19]
6	TG Tendayi	2013	An Investigation into the Applicability of Lean Thinking in an Operational Maintenance Environment	Maintenance	Lean implementation framework for Lean thinking in maintenance. It contains maintenance criteria, Lean principles and tools.	Cyclical	Science and Engineering	Masters	[20]
7	S Phelta	2016	Building Lean and Agile supply chains for food fast moving consumer goods manufacturers and food retailers in South Africa	Supply chain	Lean implementation framework for integrating Lean and Agile into the supply chain. It contains levels and aspects of theory.	Cyclical	Business	MBA	[21]
8	A Christodoulou	2010	Factors of success for the effective implementation of lean manufacturing projects within the banking sector in South Africa	Banking industry	Lean implementation framework for projects within the banking industry. It contains levels and aspects of theory.	Cyclical	Business	MBA	[22]



3.2 Step 8: Analysis and synthesis of findings

The following sections analyse and discuss the various columns in table 2.

3.2.1 Distribution of studies

While the searches and inclusion of studies were not limited to specific years, the data shows that the earliest publication was in 2010 and the majority of the studies were published later in 2019. This could attest to Lean implementation in South Africa being a relatively new field of study, and it could suggest that the need for Lean implementation frameworks in the South African industry has increased significantly in the last decade. The number breakdown of the publication found per year group are illustrated in figure 3.

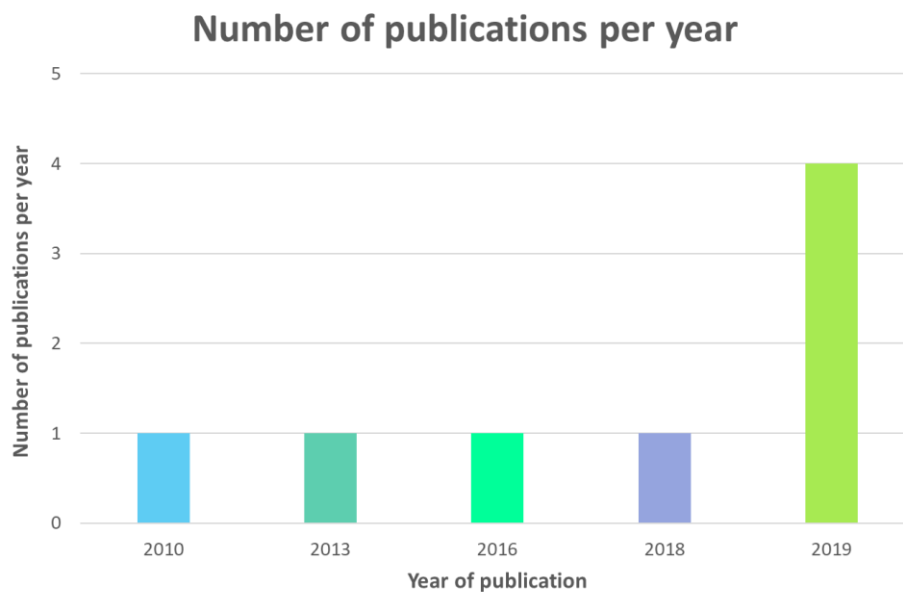


Figure 3: Bar graph of number of publications per year

3.2.2 Framework structure

From the analysis, it could be seen that all frameworks were cyclical in nature. This demonstrates the notion that Lean implementation is achieved through iterative cycles of improvement and adaption, as Lean is viewed as a cultural transformation rather than a simple set of (once-of) tools for improvement. Furthermore, this demonstrates that authors are staying true to the Lean philosophy when designing their frameworks.

3.2.3 Research discipline

This SLR was written as part of an Industrial Engineering study, as Lean is a popular branch in Industrial Engineering. However, it is well known that Lean is not purely an Industrial Engineering field of research, since it is recognised as a business philosophy as well. In a similar vein, the analysis of the selected literature, illustrated that 35.7% of the studies were in the business discipline, while only 25% was exclusively conducted in the industrial engineering discipline. Moreover, 25% of the studies were within the engineering management discipline and 12.5% of the studies was in the science and engineering discipline. The composition of publications per discipline are depicted in figure 4. This is an indication that Lean is mostly



researched in the context of business, ergo highlighting the opportunity to explore it from the industrial engineering perspective in other ways.

Percentage of publications per discipline

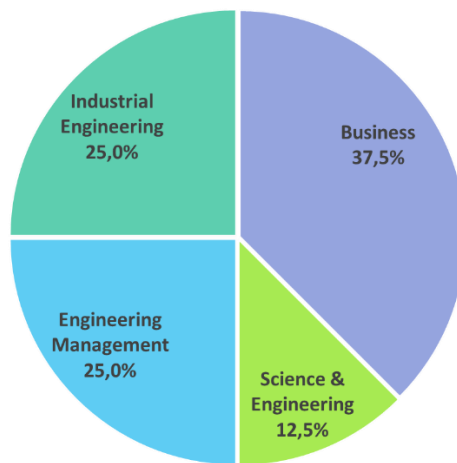


Figure 4: Pie Chart of percentage of publications per discipline

3.2.4 Study types

When analysing the studies, it was also found that the study type was heterogenous. Majority of the studies (50%) were masters studies in the engineering discipline, while 37.5% of the studies were in masters of business administration (MBA) and the remaining 12.5% were doctoral studies in engineering. This is indication that very few studies explore Lean implementation at a PhD level. This breakdown of publications per type of study is captured in figure 5.

Percentage of publications per study type

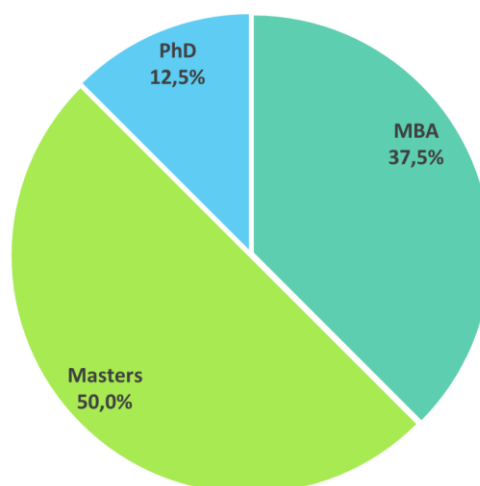


Figure 5: Pie chart of percentage of type of studies



3.2.5 Knowledge areas

When analysing the studies, the most prevalent fact was the diversity of Lean applications in different knowledge areas. Each Lean implementation framework was based in a different knowledge area (categories), with the knowledge areas being very vast. Knowledge areas of Lean applications included the following:

- Additive manufacturing project management
- Banking industry
- Construction industry
- ISO 55000 compliance in asset management
- Maintenance
- Respect for people
- Scheduling in Health care
- Supply chain

The aim of the study was to explore the available Lean implementation frameworks available in the South African context, in order to allow for the categorisation of them in terms of their application. The categorisation of the Lean implementation frameworks is captured in table 3. This diversity attests to the ability to apply Lean in a wide range of different type of industries and knowledge areas. However, each of these studies also validated the idea that Lean implementations need to be customised for different organisations and/or industries.

Table 3: Categorisation of Lean implementation frameworks

Knowledge area (Category)	Title of study
Additive manufacturing project management	A lean project management framework for additive manufacturing
Banking industry	Factors of success for the effective implementation of lean manufacturing projects within the banking sector in South Africa
Construction Industry	Application of lean principles in the South African construction industry
ISO 55000 compliance in asset management	A Framework for Implementing Lean Practices and Tools to support ISO 55000 Compliance for Physical Asset Management
Maintenance	An Investigation into the Applicability of Lean Thinking in an Operational Maintenance Environment
Respect for people	Development of the Respect for People model for lean implementation in the South African context
Scheduling in Health Care	A lean management framework for orthopaedic operating theatres of a level three public hospital, North West Province
Supply chain	Building Lean and Agile supply chains for food fast moving consumer goods manufacturers and food retailers in South Africa

4 CONCLUSIONS AND RECOMMENDATIONS

This paper aimed to explore the various Lean implementation frameworks in South Africa, in order to categorise them based on their application since it is important to understand what is available to be used in practice and industry. The compilation of these categories were presented in table 2 and 3 and found to be diverse in nature.

The aim was accomplished by conducting a scoping systematic literature review, via the methodology adapted from Albliwi et al. [14]. Studies were selected based on a review protocol. Additional to scientific databases, the SLR made use of university repositories for



searches. Utilising university repositories was necessary in order to find more literature, as the primary search on the initial databases resulted in a few resources being found. Searching in these repositories proved to have some of its own challenges. When searching on repositories, one is not given the option to conduct the search in only the keywords, titles and abstracts sections. Rather, a Boolean search expression provides results where the search terms occur in any part of the full text of the publication. Nevertheless, this study highlighted what untapped resources university repositories are for SLRs, as many literature studies fail to utilise them.

The outcomes of this systematic literature review (table 2 and 3) could support researchers and practitioners in understanding and selecting the Lean implementation framework that would best suit their needs, based on the categorisation of knowledge areas.

While this study investigated Lean implementation frameworks in South Africa, it is recommended that future studies explore this on an international level, allowing for the categorisation of their research in the field. Furthermore, future research should also examine Lean implementation models and roadmaps (as opposed to only frameworks). By investigating models and roads researchers may be able to highlight their value and support other researchers and practitioners in understanding and selecting them accordingly. Moreover, this would aid in conceptualising the correlations and variations amongst frameworks, roadmap and models.

This study highlighted that Lean is diverse in its application to knowledge areas, as is displayed in the outcomes of the SLR. From the analysis it was observed that studies were done in various disciplines, such as Industrial engineering, business, management engineering and science and engineering. However, studies are not limited to these disciplines, thus it is suggested that research explore Lean implementation frameworks in other subdisciplines of Lean (e.g. accounting and manufacturing).

Furthermore, the analysis found that Lean studies were done over various qualification levels, such as masters and doctoral level. Still, with only 12.5% of the studies being done at PhD level, it highlights the expertise of the field but also the lack of applied research on this level.

Publications found within this SLR demonstrated the diversity and range of Lean application in numerous knowledge areas within South Africa. However, Lean implementation frameworks are not limited to these knowledge areas, and future research should build on also developing frameworks in other knowledge areas, such as Lean and Green, Lean leadership, Lean accounting, Lean facilities planning or cultural adaptations of Lean.



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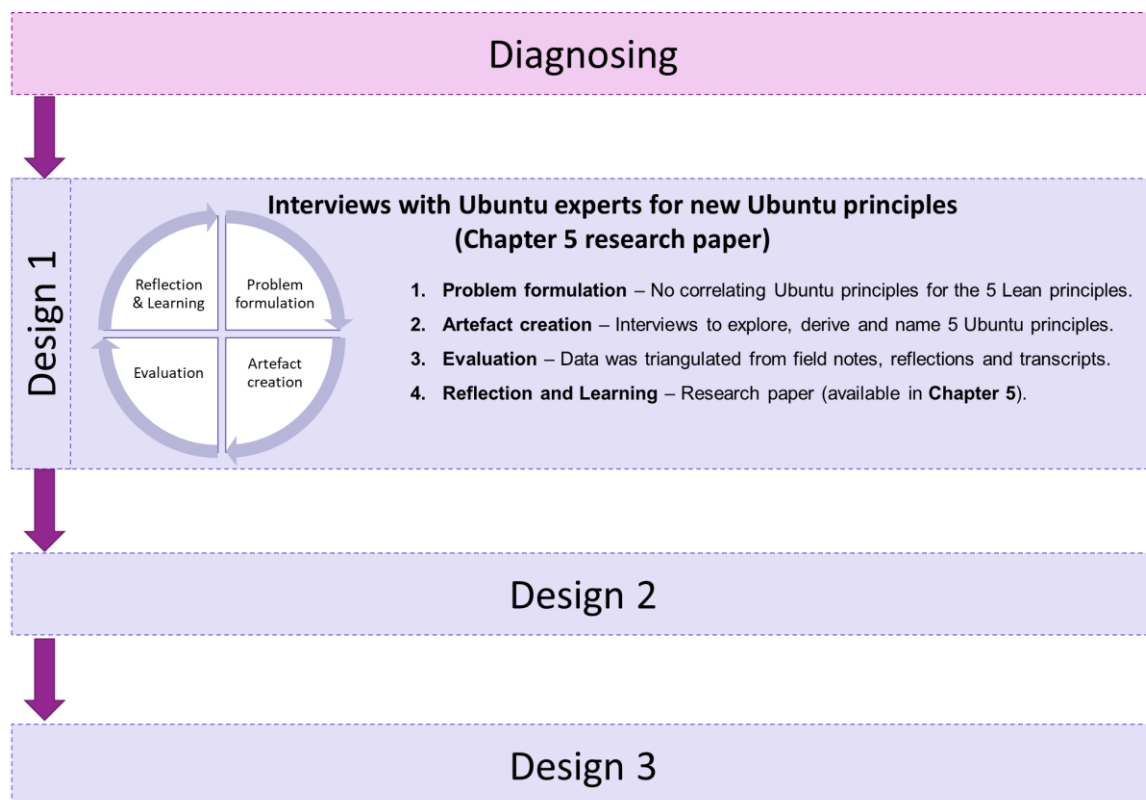
CHAPTER 5

Interviews with Ubuntu experts

This chapter presents a research paper that documents the interviews conducted with Ubuntu experts to explore established Ubuntu common practices and derive from them Ubuntu management principles that would correlate with the Lean principles that did not have correlating Ubuntu principles. This resulted in the naming of five Ubuntu principles that correspond to the process-themed, Lean principles.

This paper was submitted to the International Journal of Cross-cultural Management in October 2021.

The work portrayed in chapter forms part of the design phase 1 of the research design, as can be seen in the diagram that follows.



Ubuntu Management: A lens for Lean philosophy in South Africa

Mia Mangaroo-Pillay, Christi Niesing and Rojanette Coetzee

Abstract

The ever-growing popularity of Lean philosophy has emphasized the needed for the cultural adaptations of Lean in various countries. This need has giving rise to the creation of the Lean-Ubuntu analogy. However, there exist a gap in the research, where some Lean principles do not correlate with any existing Ubuntu principles. The purpose of this study is to investigate the variations between Japanese Lean management principles and South African Ubuntu management principles. Semi-structured interviews were used to explore established Ubuntu common practices and derive from them Ubuntu management principles that would correlate with the unmatched Lean principles.

The themes that emerged from the interviews, allowed for the naming of five new Ubuntu management principles that correlate with the unmatched Lean principles. This led to the development of the Lean-Ubuntu analogy 2.0. This research could ultimately aid in increasing buy-in of Lean and improve the effectiveness of Lean implementation in South Africa, as it provides a means to translate Lean philosophy into a South African context.

Keywords: Lean philosophy, Ubuntu philosophy, Ubuntu Management, South Africa, Semi-structured interviews, Lean analogy

1. Background

In a world where the competition is ever growing and individuals have access to global products at their fingertips, business survival is simple: improve or evaporate (Solaimani et al., 2019, Goffin and Mitchell, 2016). Lean is an organisational philosophy that provides businesses with the means to develop and improve, due to its continuous improvement strategies and waste elimination approaches (Holweg, 2007). It was developed in Japan during the 1930s, with its origins strongly rooted in Toyota (Holweg, 2007). Although Lean philosophy was originally utilised in the manufacturing industry exclusively (Coetzee, 2018); it has since transcended into various industries such as health care, the service sector and Lean has even gone green (Chiarini et al., 2018).

However, while organisations attempt to implement Lean, many make the mistake of focusing on the deployment of tools and technology short of considering people, social and cultural aspects of this philosophy (Martins et al., 2015). It is important to note that Lean is not just a toolbox, but rather a cultural change throughout the entire organisations (Martins et al., 2015, Nordin et al., 2012, Taherimashhadi and Ribas, 2018, Alkhoraif and McLaughlin, 2016). Hoogvelt and Yuasa (1994) suggest that the key to Lean's triumph in Japan is because it is deeply rooted in Japanese culture. In a similar vein, Ubuntu is a philosophy that is deeply rooted in South African culture (Broodryk, 2007). Therefore, the purpose of this study is to investigate the correlations between Japanese Lean management principles and South African Ubuntu management principles, via semi-structured interviews. The next sections provide details of each of the separate philosophies as well as a comparative summary.

1.1. Lean Philosophy

Although Lean was developed in the 1930s, it gained world popularity in the 1980s due to its quality and efficacy improvement potential (Liker, 2004). Womack and Jones (2003) explained that Lean philosophy is based on five key principles:

1. **Value** – Defining value from the customer's perspective
2. **The value stream** – Map out the set of actions required to create a product or service
3. **Flow** – Work towards continuous flow throughout the process
4. **Pull** – Use a pull system in an organisation
5. **Perfection** – Continuously strive for the perfect product or service

Satolo et al. (2017) further expresses that the five key principles gave rise to the more specific Lean *management* philosophy. This philosophy gives organisations a platform for improvement via the 14 management principles captured in the Toyota Way (Liker, 2004). The 14 Lean management principles are categorised into the 4P sections which summarised in table 1.

Table 1: The Lean management philosophy - The 14 Principles and their meanings (Liker, 2004)

Section	Principle	Summary
I – Long term philosophy	1 – Base your management decisions on a long-term philosophy even at the expense of short-term financial goals	Align the entire organisation and grow towards a bigger goal than just making a profit. Be responsible as the organisation generates value for society, customers and the economy.
	2 – Create continuous process flow to bring problems to the surface	Processes should be re-designed to accomplish value-added, continuous flow, while reducing idle time to zero.
II – The right process will produce the right results	3 - Use “pull” systems to avoid overproduction	Only produce what the customer wants, how much they want, when they want it. (Function on a just-in-time basis, which will minimize your work-in-process and inventory)

	4 - Level out the workload (Heijunka)	Eliminate wastes, overburden to resources and unevenness in production scheduling.
	5 - Build a culture of stopping to fix problems, to get quality right the first time	Equipment should have built in features that allow it to stop itself when an issue has been detected. Thereafter, visual management should be utilised to indicate the support type need
	6 - Standardized tasks are the foundation for continuous improvement and employee empowerment	Make use of constant, replicable methods throughout the organisation to maintain predictability, timing and outputs. Ergo, creating the foundations of pull and flow within the system.
	7 - Use visual control so no problems are hidden	Design simplistic visual indicators to aid employees in determining whether they are deviating from standard conditions or not. This will support pull and flow.
	8 - Use only reliable, thoroughly tested technology that serves your people and processes	Utilise technology that supports your employees and does not replaces them. It is best to manually work out a process before adding the supporting technology. Additionally, conduct annual test on the technology, whilst not being afraid to reject or modify it.
III – Add value to the organisation by developing your people and partners	9 - Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others	Leaders should be role models from within the organisation, that understand the daily work in great detail, such that they can best teach the company's philosophy to others.
	10 - Develop exceptional people and teams who follow your company's philosophy	Develop a robust, firm culture, through which company values and beliefs are widely shared and transcends over the various years. Cross-functional teams will improve quality and productivity, whilst enhancing flow by technical problem solving.
	11 - Respect your extended network of partners and suppliers by challenging them and helping them improve	Treat your partners and suppliers with veneration, like there are an extension of your organisation. Moreover, challenge them to develop by setting targets and helping them achieve it.
IV – Continuously solving root problems drives organisational Learning	12 - Go and see for yourself to thoroughly understand the situation (genchi gembutsu)	Personally, observe and verify data, by going to the source of the problem and seeing it for oneself. This will allow managers to have more than a superficial understanding of the issue.
	13 - Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly	Do not select a single direction until you have meticulously considered the alternatives. Utilise the Japanese principle of Nemawashi, which is collective decision making amongst all those affected by an issue.
	14 - Become a learning organization through relentless reflection (hansei) and continuous improvement (kaizen)	After establishing all the process, utilise continuous improvement tools to address inadequacies. This will allow for the exposure and elimination of wastes. Moreover, reflect on crucial milestones and develop best practices going forward.

1.2. Ubuntu Philosophy

The ancient African concept of Ubuntu, claimed to predate majority of indigenous African knowledge, is all about “Humanness” or what it means to be human (Broodryk, 2005, Bolden, 2014, Karsten and Illa, 2005, Kelly, 2018, Matolino and Kwindigwi, 2013, Mbigi, 1997, Van Heerden, 1998). While this philosophy has been around for millennia, it has only recently been formally documented in the 1990s. Prior to this, the Ubuntu philosophy was passed down verbally from generation to generation, as a foundation for hope (Broodryk, 2007).

In today’s world, the Ubuntu philosophy can be found in numerous African countries, such as Angola, Botswana, Ghana, Malawi, Mozambique, South Africa, the DRC, Zambia, and Zimbabwe (Mangena, 2016). However, it is reported to have originated within the earliest societies in central Africa (Mangena, 2016, Muxe Nkondo, 2007). As specific groups migrated to other parts of Africa, they carried the philosophy with them (Mangena, 2016, Muxe Nkondo, 2007). Mangena (2016) explains that as the groups formed new societies, the philosophy began to change slightly among them, whilst staying true to the original core principles and ideas of Ubuntu.

Modern day South Africa is nicknamed “The rainbow nation”, due to its rich diversity and cultural wealth. The Ubuntu philosophy governs the way in which majority of the South African population lives (Broodryk, 2005), with some people unconsciously exercising Ubuntu principles (without referring to it by name).

The foundation of Ubuntu is strongly rooted in the isiZulu aphorism “*umuntu ngumuntu ngabantu*”, meaning “I am a person through other people” (Broodryk, 2005). At its heart, Ubuntu has eight basic core values, specifically (Broodryk, 2007):

1. **Compassion** – Humanness, human rights, humanity, spontaneity, friendliness and helpfulness
2. **Forgiveness** – Understanding and consideration
3. **Responsibility** – Respect, obedience, giving unconditionally and sharing
4. **Honesty** – Good vs bad, norms and openhanded-ness
5. **Self-control** – Order, dignity, informality, redistribution and spirituality
6. **Caring** – Sympathy, appreciation and empathy
7. **Love** – Kindness, charity, tolerance and peace
8. **Perseverance** – Strength, commitment and cohesion.

The Ubuntu philosophy has grown and given rise to Ubuntu management philosophy (Broodryk, 2005). In his book, *Ubuntu Management Philosophy*, Johann Broodryk (2005) depicts the true essence of philosophy while explaining how to use it as a modern business management philosophy (Broodryk, 2005). Moreover, Johann Broodryk is credited with being the very first person to receive a PhD in Ubuntu. These management principles were later expanded upon by Msila (2015) who explained that Ubuntu is grounded in five levels (The 5Ps of Ubuntu) and principles for management, which is illustrated and detailed in table 2.

Table 2: Summary of the meaning of the Ubuntu management principles (Taken from Msila (2015))

Section	Principles	Summary
I - People centredness	1- People centred work culture - Community, solidarity, commitment	By placing focus on all employees, it fosters a feeling of responsibility to elevate the organisational culture. When employees are happy, it boosts team commitment to achieve organisational goals.
	2 - Empowering people - Team leadership and shared responsibility	Once all employees share leadership traits, it is easier to achieve the organisation's goals. Employees utilise their skills to continually develop the organisation, as responsibility is shared by all.
	3 - Transformational leadership - Inspire, motivate, influence, support	It reinforces trust and respect in an organisation, as leaders are treated with honour by fellow employees. This allows the leaders to bring about valuable change in the organisation.
	4 - Mentoring - supportive environment	To strengthen people-centredness within an organisation, Ubuntu recommends mentoring. As it aids in developing employees, such that they can grow the organisation.
	5 - Shared vision - goal directed	People-centred companies are efficacious, due to employees trying to achieve one vision. This is based on common ground with the interest of the company at heart.
II - Permeable walls	6 - Openness and honesty - supporting relationships and communication	To achieve coordination within an organisation, clear communication is key, which is supported by openness and honesty. This requires the full participation of everyone in the organisation.
III - Partisanship	7 - Loyalty to the organisation	Loyalty must be built through strong organisational values. This is achieved by cultivating and promoting collegiality, whilst reinforcing commitment within an organisation. Organisations should perform the African tradition of "sharing a calabash", by providing employees with the platform to share their ideas to build the organisation.
IV - Progeny	8 - Collective decision making	Ubuntu utilises consensus amongst employees in arriving at decisions within an organisation, as it based on the need for a "village to survive". Ergo, all employees need to participate in decision making
	9 - Sharing power and Teamwork	Power sharing within an organisation creates a sense of equality amongst employees. It fosters the importance of solidarity, responsibility and effective teamwork.
V - Productivity	10 - Continuous employee support and development	Continuously develop employees and provide them with constant support, whilst magnifying the brand and goals.
	11 - An effective team is a team with the right tools	To magnify production, effectiveness and efficiency within an organisation, employees should have access to the correct tools and equipment needed.
	12 - Strong organisational value	Effectively organisations will shape and intensification the positive values, which lead to strong employee commitment.
	13 - Rewarding employees for application of the "right culture"	Encourage employees by introducing a rewards system, ergo illustrating the benefits the organisational culture to employees.

1.3. Previous research – The Lean-Ubuntu Analogy

A previous study conducted by Mangaroo-Pillay and Coetzee (2021), explored the relationship between Lean management philosophy and the Ubuntu management philosophy. This study indicated multiple correlations between the two philosophies. However, it was also found that there were several variations between them as well (Mangaroo-Pillay and Coetzee, 2021). This led to the development of *The Lean-Ubuntu Analogy*, illustrated in figure 1.

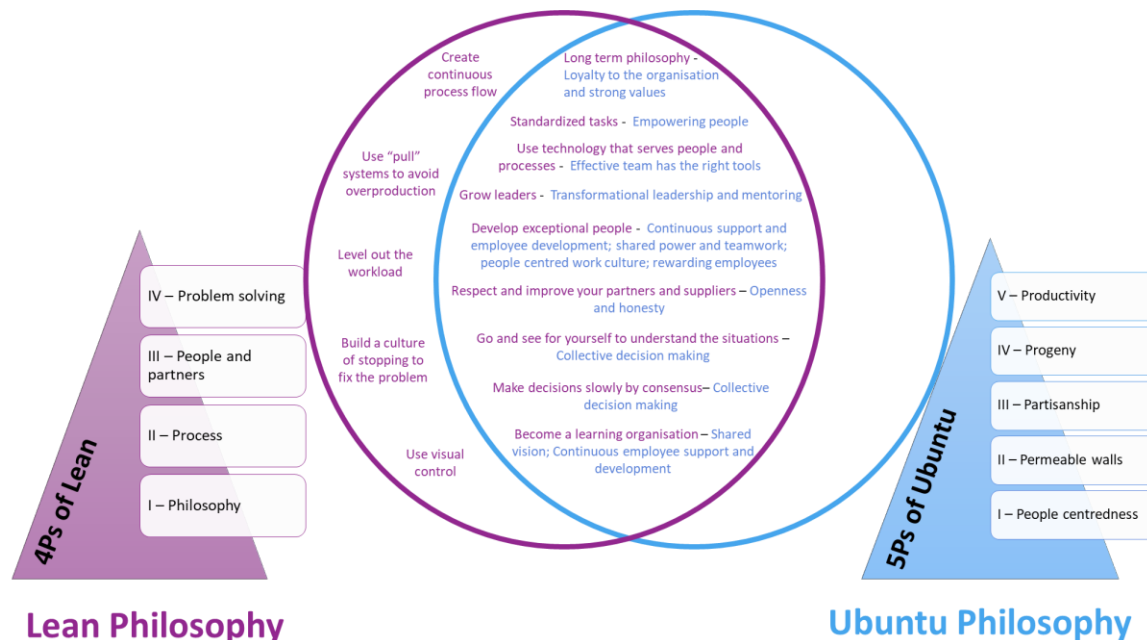


Figure 1: The Lean-Ubuntu Analogy (Taken from: Mangaroo-Pillay and Coetzee (2021))

From figure 1, the relationship between the two philosophies can be seen. While all of the Ubuntu management principles share corresponding Lean management principles, there are 5 Lean principles that do not have any Ubuntu counterparts, namely:

- Principle 2 – Create continuous process flow to bring problems to the surface
- Principle 3 - Use “pull” systems to avoid overproduction
- Principle 4 - Level out the workload (Heijunka)
- Principle 5 - Build a culture of stopping to fix problems, to get quality right the first time
- Principle 7 - Use visual control so no problems are hidden

Interestingly enough, all of the unmatched Lean principles fall within the “Process” tier of the 4P’s pyramid of Lean. This was attributed to the fact that the Lean philosophy has its origins in the manufacturing industry, ergo specialising in processes. Whereas, the Ubuntu management philosophy is targeted at generic management, thus allowing it to be utilised in any industry. Although the Lean philosophy originated in the manufacturing industry, it has since also spread to other industries.

Mangaroo-Pillay and Coetzee (2021) recommended that further investigations be conducted on the lack of corresponding Ubuntu principles, consequently paving the way for this research study. Ergo, the aim of this study is to explore established Ubuntu common practices and derive from them Ubuntu management principles that would correlate with the Lean principles that did not have correlating Ubuntu principles.

2. Research design

2.1. Research approach

A qualitative design was followed to explore Ubuntu principles in this research. This allowed for the collection and analysis of data from participants, which was based on their individual experiences of this specific phenomenon (Ubuntu management). Furthermore, allowing for the identification of informed patterns.

A phenomenology paradigm was used throughout the study. Chism et al. (2008) suggests that there are “culturally defined meanings attached to our perceptions”, and that critical phenomenology provides a platform to explore this in research. Phenomenology strives to describe the critical parts of a phenomenon, thereby finding the unfiltered, crux of experiences (Chism et al., 2008).

2.2. Research strategy

This research utilised the expert knowledge of Ubuntu academics, to discover Ubuntu principles that align with certain Lean principles. First Lean management philosophy was explained to the Ubuntu experts, thereafter they were asked the following questions:

1. What Ubuntu theory could relate to creating continuous process flow?
2. What Ubuntu theory could relate to using a “pull” system to avoid over production?
3. What Ubuntu theory could relate to levelling out the workload?
4. What Ubuntu theory could relate to stopping to fix problems and getting something right the first time?
5. What Ubuntu theory could relate to using visual control?

2.3. Research setting

Data was collected from Ubuntu experts throughout South Africa. Participants in the study were experts in Ubuntu management, who were identified via snowballing. Interviews were conducted to identify Ubuntu concepts that aligned with Lean concepts. Thereafter, the data was analysed via applied thematic analysis and used to establish Ubuntu principles that correlate with Lean principles.

2.4. Entrée and establishing researcher’s role

Prior to the commencement of the research, the researcher had obtained permission from the participants, via an independent person. Furthermore, the independent person had informed prospective participants that their participation was voluntary, and that they may withdraw at any time, from the research.

2.5. Sampling

Non-probability, purposive sampling was utilised as participants were selected for predetermined reasons. Snowball sampling was the appropriate technique, which implies that the researcher relied on members of the academic Ubuntu community to identify Ubuntu experts that can be interviewed.

Literature suggest that there is flexibility in qualitative research with regards to sample sizes. Considering the aforementioned recommendation, the researcher aimed to conduct interviews until data saturation was reached with experts or as much as can be permitted by the limitation of experts. However, it is imperative to note that the concept of Ubuntu, while very old, has only recently been documented in the traditional sense. Ergo, there is limited pool of experts on the matter. In order to mitigate this, the inclusion criteria was broad, as to include as many participants as possible. The

inclusion criteria required participants to be South African academics, who focus on research in Ubuntu management philosophy.

Table 3 captures the breakdown of the distribution of the sample. The experience and education levels of the participants are indicative of their expertise in the field. The participants are highly educated, with 4 of the 5 holding PhDs and 10% holding a master's degree. While most of the participants had less than 10 years experience, since Ubuntu management has only been formally document in literature since the late 1990s. Moreover, the participant with nearly 40 years of experience is credited with being one of the first people in history to research and document the Ubuntu philosophy, hence he is a huge key player in this field of study with mentors such as the Archbishop Desmond Tutu.

Table 3: Characteristic of the sample

Item	Category	Frequency	Percentage
Experience level	>1-10 years	4	80%
	11-20 years	0	0%
	20-30 years	0	0%
	31-40 years	1	20%
Education level	Diploma	0	0%
	Bachelor's Degree	0	0%
	Master's Degree	1	20%
	Doctoral Degree	4	80%

The sample has also exhibited high levels of competency in terms of research outputs. Table 4 indicated the number of publications per participant, as well as the number of citations each participant has accumulated. The percentage cited rate is indicative of the fact that this research field is steadily growing, and the participants are active members of the Ubuntu management research community.

Table 4: Publications of the participants

Participant	Number of publications	Number of Citations	Percentage cited
Participant 1	10	30	300%
Participant 2	39	70	179%
Participant 3	27	74	274%
Participant 4	22	713	3241%
Participant 5	5	24	480%

Though the number of participants is very low, their experience and knowledge outweigh the quantity. Thus, the sample consisted of a group of highly qualified and competent individuals.

2.6. Data collection method

In order to obtain data, semi-structured interviews were conducted with the Ubuntu management experts. Semi-structured interviews provide the perfect platform for collecting data in this research as they allowed the researcher to gain an understanding of a participant's expertise on a subject.

At the beginning of each interview, the participant was provided with a presentation explaining the concept of Lean management philosophy and the Lean-Ubuntu analogy. Thereafter the participants were asked the questions. Each interview was not limited by time. Participants were given the freedom to discuss ideas for as long as needed. Ergo, interviews ranged from 30 minutes to 1.5 hours. Whilst reviewing the transcripts, any possible ambiguities were clarified with participants via emails and/or phone calls.

2.7. Data recording

The semi-structured interviews were recorded using a video call recording tool, upon the participants granting permission to the researcher. This cumulated to 4.5 hours. Thereafter the recordings were uploaded to a cloud storage platform which was password-protected for ethical and safe-keeping reasons. This data was then transcribed; these transcripts were also stored on the aforementioned mediums. All the raw data will be stored for five years after the completion of the research (in accordance with record management policies for higher education institutions), hereafter it will be permanently deleted.

Data was recorded using multiple media, namely video recordings, transcripts, field notes and researcher reflections. While the main purpose of the videos and transcripts was to document the interviews verbatim, the field notes were utilised to capture the vibe and expressions of the participants. On the other hand, the researcher reflections allowed for documentation of any additional notes and thoughts the researcher had during or directly after the interviews.

2.8. Strategies to ensure data quality and integrity

The researcher has implemented multiple strategies to ensure data quality and integrity throughout the research process. In order to achieve this, the researcher was guided by the validity and reliability suggested by Creswell and Creswell (2017).

It is suggested that multiple validity procedures are utilised throughout a study (Creswell and Creswell, 2017). Triangulation was used to examine the data and to build coherent justification for themes (Creswell and Creswell, 2017). The research is presented using rich and thick descriptions to convey the settings and meanings of the shared experiences (Creswell and Creswell, 2017). Additionally, negative or discrepant information that runs against the themes was also presented (Creswell and Creswell, 2017). In order to achieve this, the data collect was triangulated by utilising field notes, transcripts and researcher reflection logs.

Qualitative reliability is essential for research (Creswell and Creswell, 2017). In order to achieve this, the researcher checked the transcripts and ensured that they did not contain any errors (Creswell and Creswell, 2017). Moreover, all codes developed were tracked and used consistently throughout the study (Creswell and Creswell, 2017).

2.9. Data analysis

This study adopted the four-phase cycle for data interpretation as described by Creswell and Creswell (2017), the phases being detailed as follows:

- 1) **Organise and prepare the data for analysis** → Gathered all the interview data, by transcribing it.

- 2) **Read and/or look at all the data** → Reviewed all the transcripts and tried to understand the meaning of what was said
- 3) **Start coding all of the data** → Conducted the coding process, as to break down data into relevant groups of information.
- 4) **Generate descriptions and themes** → After code allocation to the data, the researcher grouped the relevant data together, to form patterns. This was interpreted to develop conclusions. The researcher gave meaning to the research by themes converging to develop findings. The researcher made use of Atlas.Ti software for data analysis phases

3. Ethical consideration

Ethical clearance was obtained from the Engineering Research Ethics Committee of the North-West University (ethics number NWU-00105-20-A1).

Ethical considerations were handled with the utmost regard during this study. Any and all participation in the study was entirely voluntary, moreover allowing participants to withdraw at any time. Prior to the interviews, each participant was approached by an independent person to obtain their informed consent. Thereafter, the researcher contacted each participant and scheduled a meeting for the interview. The data collected during the interviews (video recordings, transcripts and field notes) was kept secure on a password protected cloud. Each interview was under 90 minutes and no intrusive, sensitive or offensive questions were asked.

4. Findings

After an applied thematic analysis, themes and patterns begun to emerge from the data. During this process, triangulation was done between the transcripts, field notes and researcher reflections in order to ensure that the data was rich and the findings had rigour. While each of the participants shared different stories or examples about Ubuntu, the crux and teaching were aligned with one another. The network diagram in figure 2 illustrates the relationships and associations found between Ubuntu and each of the Lean principles. Sections 4.1 to 4.5 discuss the findings for each of the Lean philosophy principles.

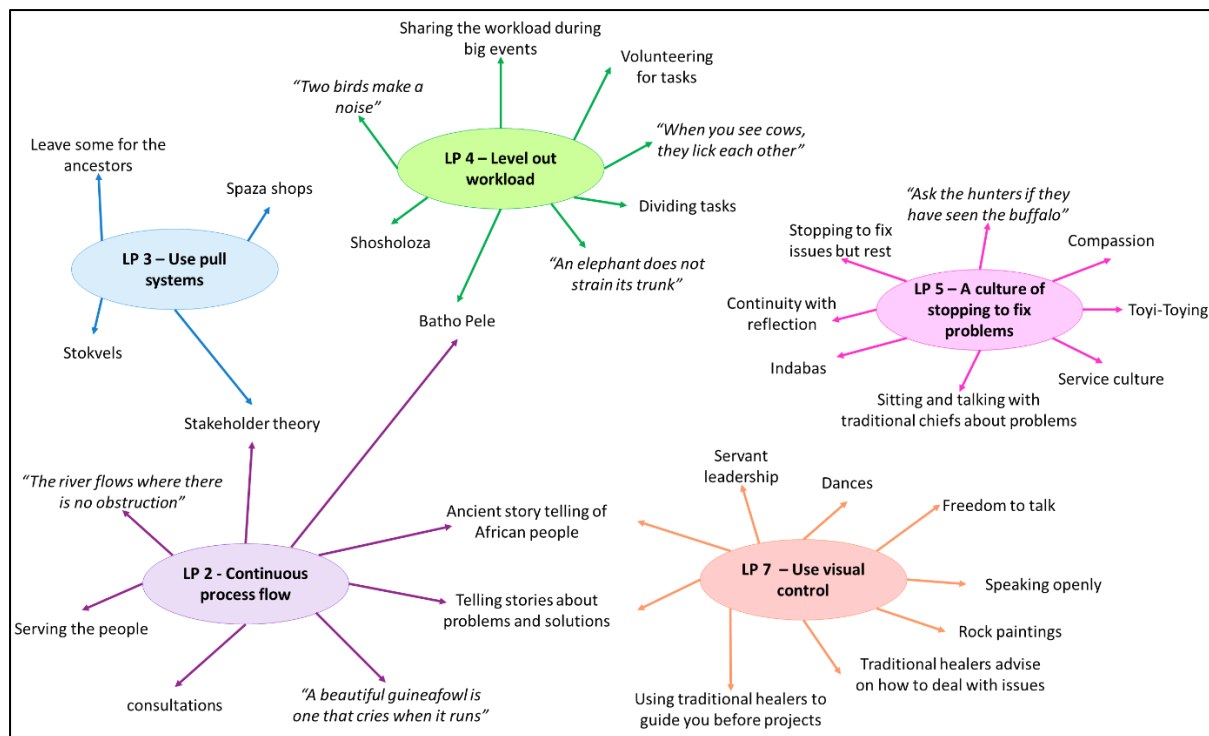


Figure 2: Network diagram of themes

4.1. LP 2 – Continuous process flow

As discussed in section 1.3, this Lean principle is focused on create continuous process flow to bring problems to the surface. During the interviews, all the participants share similar stories and examples of how Ubuntu is a culture that is people centred. Participants discussed that serving the people is a huge part of Ubuntu, this entails consulting one another with stakeholder theory playing to this. Stakeholder theory suggested that anyone who may be affected by an organisation should be consulted during projects and decisions (Friedman and Miles, 2002). Ergo, organisations should strive to understand and accommodate stakeholders. This holds true for the Ubuntu philosophy as well due to the fact that people are required to keep communication channels opened and be honest with one another. A participant alluded to this tying into the creation of continuously flow between people, so they are able to talk and bring problems to the surface.

Another participant referred to Batho Pele, which mean people first. Batho Pele is a core part of the business side of the Ubuntu philosophy. It contains aspects and principles of consultations, service standards, courtesy, access, information, openness and transparency, dealing with complaints, and giving best value (Kaisara and Pather, 2011). Moreover, in recent years, the South African government has implemented Batho Pele in various sectors. It was explained that with Batho Pele, organisations will be able to create continuous flow in processes and have the openness and transparency to discuss problems as they surface. Furthermore, it was explained by multiple participants how the ancient art of African story telling correlates with the Lean philosophy of bring problems to the surface. This ancient practise allowed people to learn lessons by discussing problems and solutions through story telling. Participants agreed that this would closely relate to bringing problems to the surface.

The following two African proverbs were discussed by participants that relates Lean principle 2:

- **“ithendele elihle ngelikhala ligijima”** an isiZulu proverb meaning “A beautiful guineafowl is one that cries when it runs” – From ones understanding of guineafowls, they are very large

birds that should not be able to fly yet the continue to persevere and fly. This proverb attests to this explaining that everything in life should be a continuous flow and one should never give up. A participant explained that this saying could be used to motivate individuals in an organisation to create continuous flow for the sake of persistence and problem solving.

- **“Amanzi agelezela lapho okwehle khona”** an isiZulu proverb meaning “The river flows where there is no obstruction” – A participant explained that flow of energy is continuous like a river with not obstructions. In an organisation, one should have flow, but in order to have this there should be no obstructions. Thus, problems must be fixed, and flow must continue.

Thus, when it comes to flow, the Ubuntu philosophy and the Lean philosophy are harmonised in the idea that one must have flow and that it should be continuous. But, for one to achieve this, one must remove all obstacles by solving problems. Connecting and consulting with the people in an organisation can aid in achieving this continuous flow.

4.2. LP 3 – Use pull systems

Lean principle 3 is aimed at using “pull” systems to avoid overproduction in an organisation (as opposed to a push system that could create excess inventory). Similar to the discussions for Lean principle 2, stakeholder theory emerged during the discussions for Lean principle 3. It became apparent that by talking to stakeholders and customers, one can manufacture what is required, when it is required. Additionally, two participants spoke about stokvels and how they are integral part of African culture and by extension a huge part of Ubuntu culture. It was clarified that stokvels are a group of people who form a club, where each month all members contribute an equal sum of money to the pot. Thereafter, a member of the group collects the total pot of money each month, making sure that each member has a month where they take the pot of money. It is imperative to note, that while this is seen as a saving scheme, it also contains a humanness aspect to it that other saving schemes do not. It was explained that stokvel leaders may sometimes use his discretion and give a member in need their money before time, by switching their turn with another member. This may be done when a funeral or unexpected expense occurs for a member. The idea of managing a stokvel can be paralleled to a pull system, as both require being intuitive to the people’s needs and managing the processes.

Some participants spoke of Spazashops during the interviews, which are informal convenience stores in communities that are far from the CBD. These shops allow for access to basic food and cleaning items, such as bread and soap, in communities that cannot easily go to grocery stores every day. Participants expressed that Spazashops play an important role in South African communities and embody the principles of traditional Ubuntu (sharing and community). However, it is important for Spazashop owners to consider the needs of their customers before purchasing stock. This notion directly correlates with Lean pull systems, as shop owners cannot have extra stock due to space and financial constraints.

One participant articulated how stokvels, stakeholder theory and Spazashops all embody a sacred aspect of traditional Ubuntu, leaving some for your ancestors. He explained that this teaching is about not overusing things and truly considering others, in terms of how it affects everyone in the system. It is about only using what is needed and sharing with others. He stated:

*“Africa is all about conservation. In my culture, you are not allowed to overharvest a plant, they say **you must leave some for the ancestors**... So, we knew that we find an amarula tree, we must leave some fruit to harvest by others. African society really thrives on not overusing things.”*

4.3. LP 4 – Level out the workload

Heijunka (production smoothing) is Lean principle 4, Level out the workload. While conducting the interviews, it was reiterated that the Ubuntu philosophy truly values sharing and teamwork. This has been extended into various aspects of life in South Africa. All the participants made some mention of dividing tasks amongst one another or volunteering for tasks in some way. They mentioned different examples like weddings or funerals, where communities get together and divide huge workloads amongst one another, often without being asked. In South Africa, and several other African countries, it is customary to invite the entire community to events. During these events, community members volunteer to cook, clean or even contribute financially to the event without being asked to do so. This Ubuntu spirit of dividing tasks transcends into the Lean philosophy of Heijunka, levelling out the workload.

Two participants made reference to Batho Pele with regards to this principle as well, discussing how the courtesy and giving best value tie in with the sharing of workloads. Another participant discussed Shosholozza, which directly translates from isiZulu to “move forward”. Shosholozza has an important historical context in South Africa as a song that was sung by groups of people while doing laborious work (such as mining) during troubling times. It reminds people to push forward and work together, with the idea that many hands make for lighter work. This song has become a symbol of hope and solidarity in South Africa, it is now sung not only during tough times, but also sung as a motivational song at sporting events to let people know that the country is behind them. Shosholozza is known to embody the traditional values of Ubuntu, holding high the values of compassion, caring and responsibility. Participants suggested that Batho Pele and Shosholozza could contribute to the Lean principle of levelling out the workload, as they directly influence people to come together and share tasks or make the workload lighter for all.

The following three African proverbs were discussed by participants that relates Lean principle 4 :

- **“Ikhoth'eyikhokthayo”** an isiZulu proverb meaning “When you see cows, they lick each other” – This proverb has been equated to the English saying of one hand washes another, to express that people should help one another and share the work they have
- **“Aku 'ndlovu yasindwa umboko wayoan”** isiZulu proverb meaning “An elephant does not strain its trunk” – This explains that an elephant does not find its own trunk heavy and does not hurt it as self-chosen burden is not felt. The idea is that picking up some work will not harm one, rather all should share in the workload.
- **“Amasongo akhala emabili”** an isiZulu proverb meaning “Two birds make a noise” – This proverb is about balance and making the burden less on another people. It expresses how birds make noise when they are together to get each other motivated to work.

Traditional Ubuntu philosophy has strong roots in togetherness and helping each other, this translates into the proverbs about sharing the work with one another. This also transcends into the aspects of Batho Pele and Shosholozza. The aforementioned themes talk to the idea of levelling out the workload that Lean principle 4 encompasses.

4.4. LP 5 – A culture of stopping to fix problems

Lean principle 5 conveys build a culture of stopping to fix problems, to get quality right the first time. While Ubuntu philosophy does not directly talk about process and stopping them, it does cover compassion and service culture. Both of these aspects allow for stopping what is happening to explore issues, being compassionate about one's employees is an integral part of Ubuntu.

A crucial part of traditional African culture, and by extension, part of the South African Ubuntu, is Indabas. Indabas are traditional meetings or conferences to discuss important issues, this dates back to precolonial times as well. It was often used to address and handle conflict between people (Newenham-Kahindi, 2009). Participants touched on how Indabas could be used to create a culture of stopping work to talk about problems and fix them before they impact production quality. Another participant discussed the ancient practice of sitting down with traditional chiefs and talking about problems in order to resolve them. This aspect ties in with that of Indabas, as well. Two participants talked about how this connects with the traditional Ubuntu practice of “continuity with reflection”, which is about always considering what has happened and how it may impact everything yet stilling moving forward.

Two participants spoke about the “modern” approaches to these traditional values, making mention of toyi-toying and “stopping to fix issues but resting”. Although toyi-toying has gained a negative reputation in the recent years in South Africa, it has significant historical value. Toyi-toying is described a high-stepping ‘dance’ match, with strong roots in the anti-apartheid protests and movements in 1980s South Africa (Alexander and McGregor, 2020). While this practice has negative connotations to it, it stems from the need to Indabas or being able to sit down and talk about issues. This can be connected with the need to create a culture of stopping to fix problems. “Stopping to fix issues but resting” was also a subject discussed by participants. They had explained that it common to see South African contractors stopping to discuss and fix issues, but that they will also stop to rest afterwards. The participants expressed that there is a culture of stopping to fix problems, in order for people to try to get quality right the first time, similar to Lean philosophy.

One participant said that the idea of stopping the process to discuss issues and fix them can be attributed to the following proverb:

- ***“Inyathi ubuzwa kwabaphambili”*** an isiZulu proverb meaning “You ask the hunters if they have seen the buffalo”. This proverb asks one to stop when their struggling or when they encounter a problem and ask those who are experienced for advice on the problem. It is about creating a culture of stopping to ask for help and fix problems before they impact the quality of the work.

4.5. LP 7 – Use visual control

Lean principle 7 is intended for using visual control so no problems are hidden in an organisation. This principle uses visual aids to guide employees in determining if the work or product is correct. All participants agreed that Ubuntu philosophy has no particular mention of any sort of visual control, however a vital part of Ubuntu is talking in order to aid people in decision making and understanding problems. Though, one participant referred to cave paintings that were used in ancient Ubuntu practices to document stories, problem and solutions. Another participant referred to dancing as a way of storytelling about problems and solutions. It was explained that this falls under servant leadership, which is a core facet of the Ubuntu philosophy.

Ergo, talking and storytelling play a role in aiding people to determine the ins and outs of tasks and providing guidance. This can be equated to visual control in the Lean philosophy. Participants mentioned the ancient African practice of storytelling around a fire at night, they also spoke about how storytelling is still used today to teach many people ways to solve problems. Three participants discussed traditional healers, explaining how they are often consulted before big projects or about issues in general. Traditional healers regularly provide advice and guidance in the form of storytelling. One of the participants eloquently expressed the relationship between Lean's visual control and Ubuntu's story telling as:

*"We must remember the way Africans were educated was um, by means of storytelling. People sit around the fire and the elders will tell stories at night. In that way, they educated the people in morals, values and knowledge. So, yes, I think visuals are important, but in Ubuntu, **by telling stories people will learn what are the standards and what is required**. It can help people to produce the right results. There are certain producers that are taught like this."*

5. Discussion

Lean philosophy is seen as eastern and Ubuntu philosophy is seen as African, while they may seem worlds apart, their similarities were truly highlighted during the interviews. During the interviews with the participants, many of them shared different stories or examples of Ubuntu, however after a thematic analysis of the transcripts it was evident that the crux and teaching of the stories aligned with one another. Figure 3 was created to illustrate the relationship between Lean principles and the Ubuntu principles discovered during the interviews. It is important to note that this diagram will act as an update to the Lean-Ubuntu analogy (figure 1), thereby addressing the variations between the philosophies highlighted in the Lean-Ubuntu analogy. Therefore, figure 3 has been named The Lean-Ubuntu analogy 2.0.

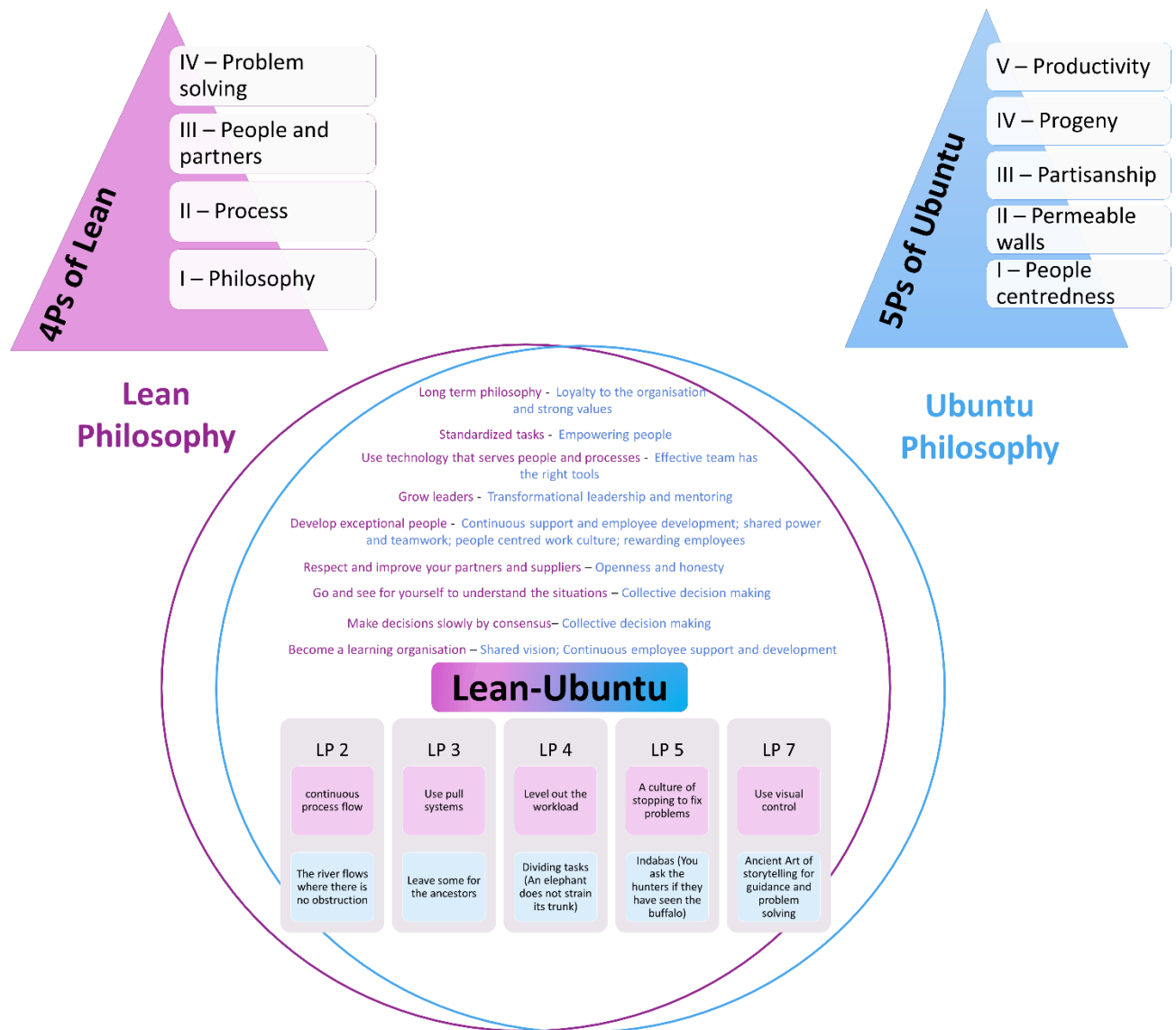


Figure 3: The Lean-Ubuntu analogy 2.0

Figure 3 is called The Lean-Ubuntu analogy companion, which illustrates the correlations between each of the Lean and Ubuntu principles. The synergy between these principles is displayed with each step leading to the harmony between Lean and Ubuntu (top block of the diagram). A proverb or teaching, which best describes and summaries the findings of the Ubuntu principle, was selected for each corresponding Lean principle. In summary it is:

- **LP 2 (Create continuous process flow to bring problems to the surface)** – The river follows where there is no obstacle highlighting the importance of continuous flow in a process. Additionally, it speaks to letting all obstacles (problems) come to the surface so the flow can continue.
- **LP 3 (Use “pull” systems to avoid overproduction)** – Leave some for the ancestors. This proverb best conveys the teachings and principles of Spazashops and stokvels, with respect to only using or providing what is needed when it is needed (i.e. Pull systems). Furthermore, it conveys the message of not overusing or producing an item.
- **LP 4 (Level out the workload (Heijunka))** - Dividing tasks (An elephant does not strain its trunk). This proverb encapsulates the traditional Ubuntu values of dividing tasks and

understanding that doing your part will not harm you. It captures the essence of levelling out the workload.

- **LP 5 (Build a culture of stopping to fix problems, to get quality right the first time)** - Indabas (You ask the hunters if they have seen the buffalo). This practice and proverb captures the teaching of stopping to discuss and fix problems. Furthermore, it conveys the message of stopping to ask for help and getting things fixed as soon as possible.
- **LP 7 (Use visual control so no problems are hidden)** - Ancient Art of storytelling for guidance and problem solving. This practice summarises the fact that storytelling is a huge part of South African culture and holds the same teachings as visual control.

6. Conclusions

The ever-growing popularity of Lean philosophy has emphasized the need for cultural adaptations of Lean in various organisations and countries. This need has giving rise to the creation of the Lean-Ubuntu analogy. However, there were several variations between the Lean management philosophy and the Ubuntu management philosophy. This study focused on addressing these variations, by conducting interviews with Ubuntu experts to uncover any correlations that may exist.

It was found that various examples and stories about Ubuntu all shared the common thread of understanding and humanness, which are key values of Ubuntu. These stories lead to the development of correlating Ubuntu principles for the unmatched Lean principles of the Lean-Ubuntu analogy. Moreover, the interviews also lead to the creation of the Lean-Ubuntu analogy 2.0 diagram, which illustrates the summarised values of each principle.

This research could ultimately aid in increasing buy-in of Lean and improve the effectiveness of Lean implementation, as it provides a means to translate Lean philosophy into a South African context.

While the similarities between Lean and Ubuntu are promising, it is recommended that future research explore the practical implementation of the Lean-Ubuntu analogy.

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Rev. and updated.

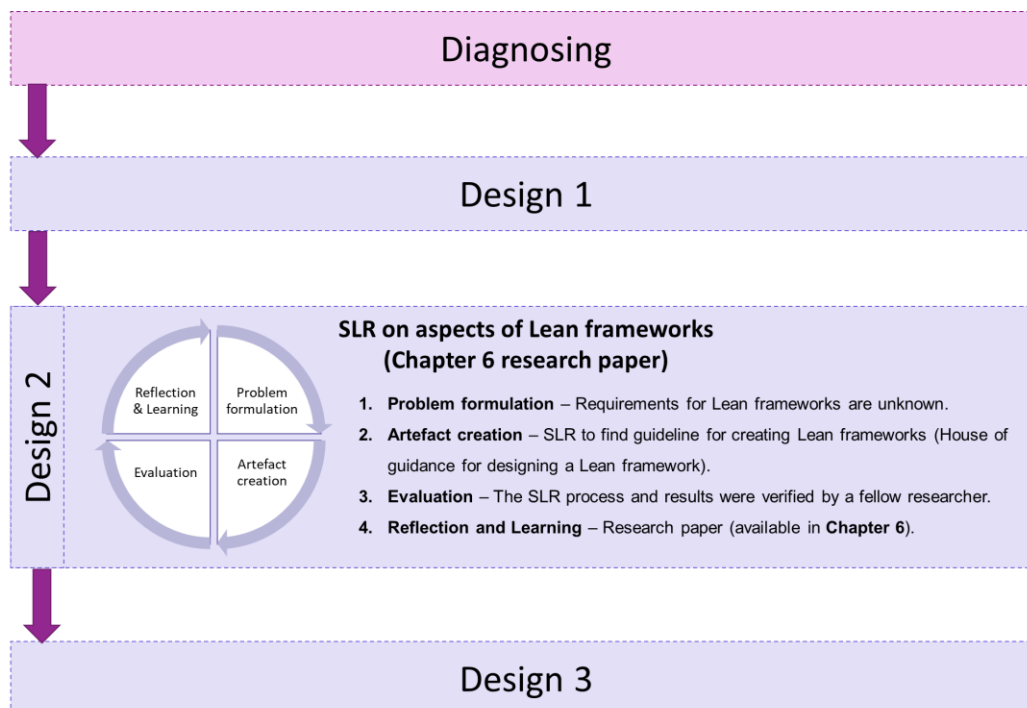
CHAPTER 6

Systematic Literature Review on Lean framework design methods and elements

This chapter documents a research paper that explored and analysed available Lean frameworks, in order to determine common design methods and elements amongst them. This led to the development of the “House of guidance for designing a Lean framework”, which included the following: 1) guidelines to the applicable literature to consider, 2) design element to include, 3) design methods to consider and 4) methods to test a Lean framework with.

This research paper was accepted by the Journal of Industrial Engineering and Management in November 2021 and is in the process of page setting before publication.

The work portrayed in chapter forms part of the design phase 2 of the research design, as can be seen in the diagram that follows.



Lean Frameworks: A Systematic Literature Review (SLR) Investigating Methods and Design Elements

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Abstract:

Purpose: Despite the influx of Lean frameworks in literature, there seems to be no standardised or established methods for designing them. Therefore, the purpose of this research is to investigate what design methods and design elements are utilised in creating Lean frameworks.

Design/methodology/approach: A systematic literature review (SLR) was conducted to find all the available studies on Lean frameworks.

Findings: This study found that the formation of the framework could be broken down into four different categories; namely: approaches or methods for designing, design elements to include, theory to investigate during the literature studies and framework testing methods for evaluating the framework.

Research limitations/implications: While this research focused on Lean frameworks, it is recommended that future studies look at Lean models and roadmaps.

Practical implications: The artefact created in this study, the House of Guidance, will provide future researchers with a guideline on how to go about designing a Lean framework.

Social implications: N/A

Originality/value: The SLR looked at pre-existing framework, in order to extract the categories for the development of Lean frameworks. This study presents the House of Guidance (an original artefact), to aid in the design and creation of future Lean Frameworks.

Keywords: lean philosophy, lean frameworks, lean framework design, systematic literature review, SLR

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1. Introduction

Lean has been adopted by various organisations, as a management approach to give a competitive advantage by increasing efficiency via waste elimination (Nordin, Deros, Wahab & Rahman, 2012), but why are more than 90% of Lean implementations unsuccessful? Miina (2012) reports that less than 10% of Lean implementations are

successful. As for the high failure rate, researchers are exploring the barriers to Lean implementation (Amer & Shaw, 2014). Some barriers include low involvement from leaders, poor employee attitudes, insufficient resources and organisational cultural issues (Amer & Shaw, 2014).

In previous research, it was noted that Lean is an overall cultural change within an organisation, as it demands commitment from all organisational levels for success (Ahmad, 2013; Alkhoraif & McLaughlin, 2016; Bhasin, 2012; Keiser, 2012; Mangaroo-Pillay & Coetzee, 2020; Martins, Affonso, Tamayo, Lamouri, & Ngayo, 2015; Nordin et al., 2012; Yamamoto & Bellgran, 2010). Additionally, these authors have supported that Lean implementation is different for each organisation and/or industry, ergo Lean requires some measure of customisation, as it cannot be utilised as a standalone toolbox for success (Ahmad, 2013; Alkhoraif & McLaughlin, 2016; Bhasin, 2012; Keiser, 2012; Mangaroo-Pillay & Coetzee, 2020; Martins et al., 2015; Nordin et al., 2012; Yamamoto & Bellgran, 2010). Due to the ever-growing need of Lean, many academics and scholars have developed various Lean frameworks (Anand & Kodali, 2009). Lean frameworks can be found in several industries, with some of the most well-noted ones being in healthcare, manufacturing, accounting, service industries, management, supply chain and human factor engineering to name a few.

However, despite the influx of Lean frameworks in literature, there seems to be no standard, established methods or guidelines for designing these important frameworks. Additionally, it is unclear what the design elements of such a framework should be. Without this guidance on the methods and elements, it is also difficult to verify and validate Lean frameworks for their applicability.

Therefore, this study plans to investigate the available literature on the design method and design elements for developing Lean frameworks.

For the purpose of this study, it is imperative to clarify some terminology used within design literature. While there is no all-inclusive definition of what a framework is, various authors have included their interpretations of frameworks in their research. Yusof and Aspinwall (2000) expressed that a framework is a prescriptive set of things to do, and that frameworks may be a diagram or graphic representation of a theory. Correspondingly, Hakes (1991) agrees that frameworks are there to translate a theory into something practical for implementation in a systematic manner. In a more comprehensive effort, Aalbrecht, Hejka, and McNeley (1991) and Anand and Kodali (2009) articulated that frameworks must:

- Depict an outline of a philosophy
- Communicate a change process that should be adopted in order to achieve a new vision
- Compel different parties within an organisation to address a substantial list of key issues

Some literature may use the terminology 'framework' and 'model' as interchangeable terms or synonyms, although there is a significant difference between these terms. According to Difference Between (2013), a framework is a means of demonstrating the empirical relations amongst every aspect of inquiry in terms of scientific theory or research, ergo it illustrates the general direction and the constraints of a theory. Whereas a model is described as something which is used to explain the operation and mechanisms of something (Difference Between, 2013). Therefore, a framework is better suited for creating a general plan for implementation of a theory in a nonspecific organisation. Furthermore, because various studies utilised mathematical and programming models as lean models, this study will focus on Lean frameworks solely.

2. Research Aim

Therefore, the aim of this research is to conduct a Systematic Literature Review (SLR) to investigate which design methods and design elements were used for established frameworks.

3. Research Method

This study followed the SLR method, as described by Albliwi, Antony, Abdul-Halim-Lim & van der Wiele (2014). The method consists of three phases: Planning, conducting and documenting. The steps within these phases are detailed as follows (Albliwi et al., 2014):

A) Planning the review

- **Step 1 – Research purpose and objective** – The purpose of the SLR and the objects must be clearly set out
- **Step 2 – Develop research protocol** – Create the research protocol, which must include the inclusion criteria, exclusion criteria, databases to be searched, keywords and quality assessment criteria.

B) Conducting the review

- **Step 3 – Establish relevance criteria** – Establish which types of studies are relevant to the study (Update the inclusion and exclusion criterion)
- **Step 4 – Search and retrieve the literature** - Search the selected electronic databases for literature
- **Step 5 – Selection of studies** – Select literature based on the inclusion and exclusion criteria
- **Step 6 – Quality assessment for relevant studies** – Assess the literature for quality
- **Step 7 – Data extraction** – extract data from the selected literature
- **Step 8 – Synthesis of studies (analysis)** – Extract facts and conclusions from the selected literature

C) Documenting the review

- **Step 9 – Reporting** – Report on the SLR in detail
- **Step 10 – Dissemination** – Publish the SLR findings in an academic source

4. Findings**4.1. Step 1: Research Purpose and Objective**

The purpose and objectives of the SLR are captured in section 1 and 2 of this research paper: To investigate literature on the design method and design elements for developing Lean frameworks. The aim was divided into the following objectives: (1) to find out what design methods are used to create frameworks and (2) to find design elements are present in established frameworks.

4.2. Step 2: Develop Research Protocol

The review protocol was developed in collaboration with a co-researcher and is indicated in Table 1. As to allow for the inclusion of all existing, relevant literature on the topic, this SLR was not restricted to a specific date range of publication.

Purpose of the study	To establish which design methods and elements are utilised to develop Lean frameworks.
Inclusion criteria	Literature including “Lean framework” in their title, abstract or keywords. Literature should explain the methodology followed to develop the framework
Exclusion criteria	Lean literature related to obesity/weight-loss Literature that utilises a prior developed framework (i.e. If the framework is not developed within the specific study) Literature on Lean Six Sigma frameworks (i.e. This study is focused on purely on Lean frameworks and not hybrids thereof) Non-English literature
Search databases	Searches were conducted on 7 databases, namely: ScienceDirect, Scopus, IEEE Xplore, Web of Science, EBSCOhost Emerald Insight Journals Google scholar
Keywords	All the selected databases were searched using the following key words: “Lean framework”
Quality Assessment Criteria	All duplicate literature was excluded Recovered literature will be checked for relevance (besides inclusion and exclusion criteria)

Table 1. Research protocol

4.3. Step 3: Establish Relevance Criteria

Due to the minimal amount of literature, no alterations were made to the inclusion and exclusion criteria, as to maximise the search outputs. Therefore, the inclusion and exclusion criteria given in Table 1 were utilised, as is.

4.4. Step 4 to 6: Search, Selection and Quality Assessment of the Literature

The literature selection process for steps 4 to 6 are illustrated in Figure 1, which allowed for the search, selection and quality check of the resources found. The initial search resulted in 161 resources from the seven databases. After screening the 161 literature resources (based on the research protocol), only 14 were selected for the quality check. Resources were rejected due to the following reasons:

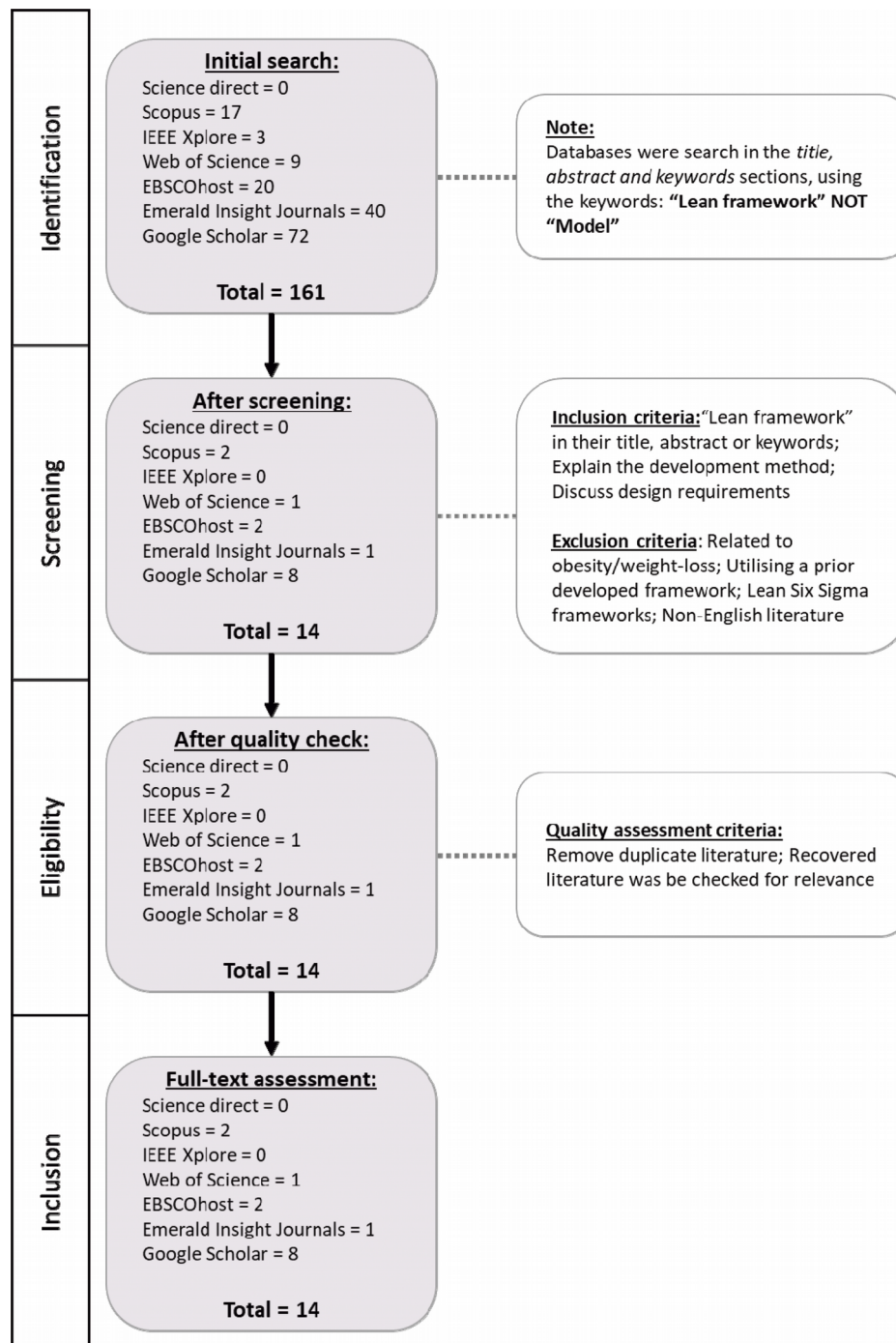


Figure 1. Literature selection process

- Several sources were found to have misunderstood the concept of Lean

- Some sources merged Lean with other continuous improvement theories
- Multiple sources referred to mathematical models as frameworks for reducing time in Lean processes
- Few sources were referring to existing Lean frameworks, which were not designed within that specific study
- Few sources were leading towards the development of Lean frameworks in future studies
- Various sources referred to ‘Implementing the Lean framework’, when discussing implementation of the Lean philosophy in general
- Few sources referred to value stream maps and facility layouts as Lean frameworks

Thereafter, these 14 resources passed the quality check and were included for full-text assessment. The final selection of resources are detailed in Table 2, indicating the authors, year, title and type of resource.

#	Author(s) and Year	Title	Type of source
1	Alkhorairif, McLaughlin and Rashid (2019)	A framework to improve lean implementation by review leveraging aspects of organisational culture: the case of Saudi Arabia.	Journal article
2	Almutairi, Salonitis & Al-Ashaab, (2019)	A framework for implementing lean principles in the supply chain management at health-care organizations.	Journal article
3	Alturkistani (2018)	Development of a lean principles framework for ERP implementation process.	Thesis
4	Anand and Kodali (2009)	Development of a framework for lean manufacturing systems.	Journal article
5	Bhamu, Singh-Sangwan and Mehta (2013)	Development and validation of lean manufacturing drivers, barriers and framework with a focus on ceramic industry.	Thesis
6	Lermen, Echeveste, Peralta, Sonogo & Marcon (2018)	A framework for selecting lean practices in sustainable product development: The case study of a Brazilian agroindustry.	Journal article
7	Macias de Anda (2018)	Integrate National Culture in the Design of Lean Systems.	Thesis
8	Malaeb and Hamzeh (2018)	Evaluating PPP projects using a lean framework.	Journal article
9	Maqbool, Rafique, Hussain, Ali, Javed, Amjad et al. (2019)	An Implementation Framework to Attain 6R-Based Sustainable Lean Implementation—A Case Study	Journal article
10	Mirdad and Eseonu (2015)	A conceptual map of the lean nomenclature: comparing expert classification to the lean literature.	Journal article
11	Mostafa, Dumrak & Soltan (2013)	A framework for lean manufacturing implementation	Journal article
12	Perez (2014)	Enterprise Architecture Framework of a Lean Enterprise Transformation	Thesis
13	Welo, Olsen & Gudem (2012)	Enhancing product innovation through a customer-centered, Lean framework	Journal article
14	Yang (2012)	A lean framework for tooling design process in Chinese aerospace.	Thesis

Table 2. Resources found

4.5. Step 7 to 8: Data Extraction and Synthesis (Analysis) of Studies

The resources found (Table 2) were investigated and the relevant information was extracted. Resources were loaded in the Atlas Ti software, thereafter they were coded and analysed to find recurring themes or patterns (allowing for synthesis of the literature). Upon reviewing each resource, it was evident that the formation of Lean frameworks could be divided into four different categories, namely:

1. **Literature studies** - Topics considered during the literature study when design lean implementation frameworks.
2. **Approaches or methods** - Design methods or approaches utilised to create the framework
3. **Design elements** – Aspects or elements that were included within the framework
4. **Framework testing** - Evaluation methods used to validate the framework

After the initial coding process in Atlas Ti, a network (relationship) model was generated to understand the correlations between the different categories. The network model generated post coding (Figure 2) illustrate the aforementioned categories (dark black borders), along with their themes (red dotted lines) and connections (black solid lines) to one another. Thereafter, a matrix was created to illustrate the breakdown of each category in relation to each resource found (Figure 3). Following the figure, each category is discussed with respect to the themes found.

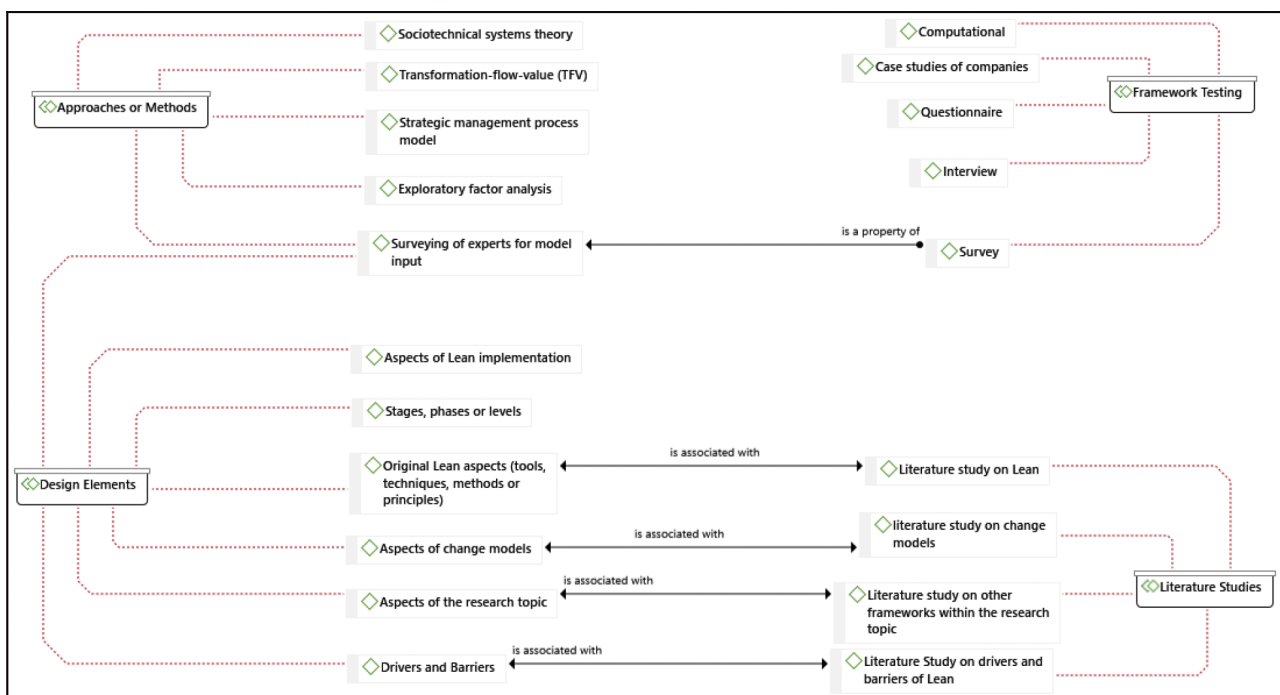


Figure 2. Network model generated in Atlas Ti

4.5.1. Literature Review

Amongst the themes found, the literature studies of the various resources (Alkhoraif et al., 2019, Alturkistani, 2018, Macias de Anda, 2018, Welo et al., 2012, Yang, 2012) discussed **(a) Lean theory** in varying levels of detail. These resources explored and established views on Lean history, definitions and principles. They further went on to discuss **(b) barriers and drives of Lean**, this allowed them to understand what factors to include and exclude from their frameworks, thereby increase the rate of success when implemented (Yang, 2012, Mostafa et al., 2013, Macias de Anda, 2018, Bhamu et al., 2013, Alturkistani, 2018). Another strategy applied by many authors was to investigate **(c) other frameworks within the research topic**, thus allowing them to establish norms of the field and lean frameworks (Alturkistani, 2018, Almutairi et al., 2019, Anand & Kodali, 2009, Bhamu et al., 2013, Lermen

et al., 2018, Maqbool et al., 2019, Perez, 2014, Welo et al., 2012, Yang, 2012). Additionally, some papers inspected change models, in order to allow for the incorporation of **(d) change management aspects** into the developed Lean framework (Alturkistani, 2018).

Author(s) Categories found	Alkhoraif et al. (2019)	Almutairi et al. (2019)	Alturkistani (2018)	Anand and Kodali (2009)	Bhamu (2013)	Lermen et al. (2018)	Macias de Anda (2018)	Malaeb and Hamzeh (2018)	Maqbool et al. (2019)	Mirdad and Eseonu (2015)	Mostafa et al. (2013)	Perez (2014)	Welo et al. (2012)	Yang (2012)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Literature Studies														
(a) Lean	X		X				X			X			X	X
(b) Drivers and barriers to Lean			X		X		X				X			X
(c) Other frameworks within the research topic		X	X	X	X	X			X			X	X	X
(d) Change models			X											
2. Approaches or Methods														
(a) Transformation-flow-value (TFV)								X						
(b) Sociotechnical systems theory							X							
(c) Exploratory factor analysis					X									
(d) Strategic management process model							X							
(e) Surveying of experts for input			X											
3. Design Elements														
(a) Surveying of experts for input			X							X				
(b) Stages, phases or levels		X	X	X	X	X	X	X	X	X	X	X	X	X
(c) Aspects of Lean implementation		X		X	X				X			X		X
(d) Original Lean aspects (tools, techniques, methods or principles)	X	X	X	X	X	X	X	X		X				X
(e) Drivers and barriers	X		X		X		X				X			X
(f) Aspects of the research topic	X	X	X	X	X	X	X	X	X	X	X	X	X	X
(g) Aspects of change models		X												
4. Framework Testing														
(a) Interviews														X
(b) Case studies of companies			X	X		X			X				X	
(c) Questionnaires							X							X
(d) Computational											X			
(e) Surveys			X							X				

Figure 3. Breakdown of categories and themes found in the resources

4.5.2. Approaches or Methods

Upon studying the various approaches or methods utilised to create the Lean frameworks, it could be seen that authors have their individual methods and that there is no standard/generic method to utilise. One paper utilised the **(a) transformation-flow-value (TFV)** method, which allows for the evaluation of Lean KPIs in the three perspectives (Transformation, Flow and Value). Where transformation evaluates the inputs and outputs of a process, flow studies all the flows between processes, and value considers the customers' requirements. The TFV method allowed for the development of a Lean Framework that works on all three levels (Malaeb and Hamzeh, 2018).

Another study (Macias de Anda, 2018) applied **(b) Sociotechnical Systems Theory** as an approach to developing a Lean framework. This incorporates four subsystems: Humans, Work Organisation, External Environment and Technology, which when utilised together with Lean philosophy gives a holistic view of how the Lean framework will function. Macias de Anda (2018) explains that Sociotechnical Systems Theory allowed for integration of national culture, Lean and the manufacturing system within the design framework.

The same study (Macias de Anda, 2018) also used **(c) Strategic Management Process** as another method due to its ability to determine the effects of Lean by analysing its influence on the organisational performance. This method consists of four phases: Intent, Formulation, Implementation and Evaluation (Macias de Anda, 2018), which allowed for the development of the Lean Framework and evaluation on a strategic level.

Bhamu et al. (2013) used the method of **(d) Exploratory Factor analysis**, which permitted the analysis of various factors on Lean (Bhamu et al., 2013). This study explored three factors and developed the framework around that, namely: Organisational policies, External and Internal drivers of Lean implementation (Bhamu et al., 2013). This study also utilised the barriers and drivers of Lean, by translating them into factors that should be incorporated into the framework, thus ensuring a higher success rate of Lean (Bhamu et al., 2013).

A study by Alturkistani (2018) utilised **(e) surveying experts** as a means for input for the frameworks structure and content (Alturkistani, 2018). This study designed and conducted surveys on experts to investigate the requirements for the field specific Lean framework, which allowed for the inclusion of factors that often contribute to the success of an implementation.

4.5.3. Design Elements

When analysing the various frameworks found during the SLR, trends and patterns in terms of design elements began to emerge. One study (Alturkistani, 2018) utilised **(a) input from surveys with experts** as design elements for the Lean framework. This created design requirements from the survey inputs. Furthermore, almost all the studies reviewed had a common design element as almost all frameworks contained **(b) stages, phases or levels** (Alturkistani, 2018, Almutairi et al., 2019, Anand and Kodali, 2009, Bhamu et al., 2013, Lermen et al., 2018, Macias de Anda, 2018, Malaeb and Hamzeh, 2018, Maqbool et al., 2019, Mirdad and Eseonu, 2015, Mostafa et al., 2013, Perez, 2014, Welo et al., 2012, Yang, 2012). The various stages, phases or levels convey the complexities and requirements of the framework for different parties within the organisation.

Multiple studies utilised **(c) aspects of Lean implementation** in their Lean frameworks, which enables authors to create design requirements that aid in Lean implementation, thereby increasing the chance for a successful Lean implementation of the Framework (Almutairi et al., 2019, Anand and Kodali, 2009, Bhamu et al., 2013, Maqbool et al., 2019, Perez, 2014, Yang, 2012). Moreover, most Lean frameworks also contained **(d) original aspects of Lean**, such as tools, techniques, methods and principles (Alkhoraif et al., 2019, Almutairi et al., 2019, Alturkistani, 2018, Anand and Kodali, 2009, Bhamu et al., 2013, Lermen et al., 2018, Macias de Anda, 2018). By doing this, authors ensure that their framework stays true to the intended philosophy of Lean, whilst incorporating their new work.

Numerous frameworks (Alkhoraif et al., 2019, Alturkistani, 2018, Bhamu et al., 2013, Macias de Anda, 2018, Mostafa et al., 2013, Yang, 2012) made use of the **(e) drivers and barriers of Lean** as design elements. This entailed researcher converting barriers into design requirements and utilising the drivers as design requirements, thus ensuring a better chance of a successful implementation. All the studies made use of **(f) aspects of the research topic** as a design element in their frameworks, thereby incorporating recognisable elements of the relevant field in which the framework will be implemented. However, only one study (Alturkistani, 2018) used the important **(g) aspects of change models** as a design element. This study aimed to incorporate aspects of change management into the framework, as to ensure a smoother transition when utilising this framework.

4.5.4. Framework Testing

There is an abundance of methods to test a developed framework. One study (Yang, 2012) utilised **(a) interviews** with academic experts and administered **(c) questionnaires** to industry experts to validate the Lean framework. This allowed for feedback from experts to be incorporated into the framework, thereby improving it (Yang, 2012). Likewise, another study (Macias de Anda, 2018) utilised a questionnaire to validate its framework. It is imperative to note the difference between questionnaires and surveys: Questionnaires are designed and analysed via statistical analysis (Bartolucci, Bacci & Gnaldi, 2015), whereas surveys do not need to be designed via statistical methods. Additionally, some studies (Mirdad and Eseonu, 2015, Alturkistani, 2018) made use of **(e) surveys** in order to

validate their frameworks. In a similar vein to the questionnaires, these studies surveyed experts to gain feedback on the frameworks, and as such to incorporate it.

One study (Mostafa et al., 2013) conducted **(d) computational testing** on their framework, by using mathematical models to analyse the trade-offs between aspects within the framework concerning Lean and Lean practices (Mostafa et al., 2013). In Addition, several studies (Alturkistani, 2018, Anand and Kodali, 2009, Lermen et al., 2018, Maqbool et al., 2019, Welo et al., 2012) conducted their testing via **(b) case studies of companies**, where the frameworks were implemented at organisations and altered based on implementation results.

4.6. Step 9: Reporting

After the SLR was conducted, it became evident that there were various aspects that play a role in the formation, creation or designing of a Lean framework. The various aspects (mentioned in section 4.5) were utilised to design the House of Guidance for designing a Lean framework (Figure 4), providing guidance for future researchers when designing a Lean framework. Figure 4 was fashioned in the image of the Toyota way house, which is an iconic artefact in Lean philosophy (Liker, Hoseus, People & Organizations, 2008). It starts off by creating a strong foundation that is grounded in research, by suggesting that researchers explore some specific aspects during their literature study phase. Thereafter, Pillar A and Pillar B should be considered in parallel. Scholars should select a design method to follow, and design elements to include when creating their framework. Lastly, the house is sealed off with a sturdy roof in the form of testing the framework. Researchers are prompted to select an appropriate strategy for evaluating the applicability and reliability of their designed frameworks.

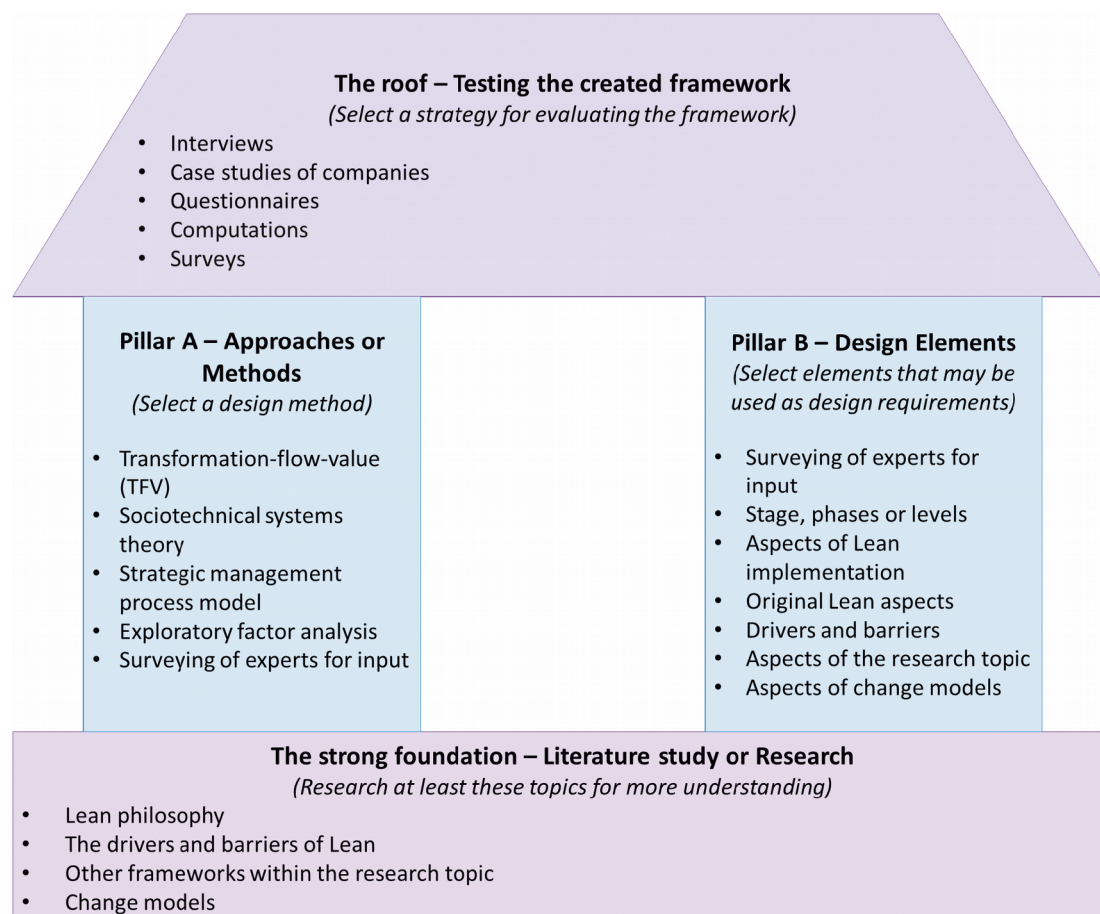


Figure 4. House of guidance for designing a Lean framework

5. Discussions and Conclusions

Due to the ever-growing interest in the Lean philosophy, a multitude of researchers have designed Lean frameworks, that incorporate aspects of the philosophy. However, there is no standardised/official method for specifically creating a Lean framework. Therefore, this SLR aimed to investigate the design methods and design elements for established Lean frameworks.

Whilst conducting this SLR, the need for an in-depth literature study prior to designing a Lean framework was highlighted. Majority of the studies found in this SLR started with a literature study to investigate aspect such as Lean, barriers and driver of Lean and other frameworks within the research topic. This allowed them to have a foundation of common elements in Lean frameworks and to incorporate factors that will increase the chance of success for their frameworks during implementations. Therefore, it is recommended that when designing a Lean framework, at least the following topics be investigated during the literatures study:

- **Lean philosophy** – In order to understand the various tools and techniques within the Lean philosophy
- **The drivers and barriers of Lean** – In order to incorporate factors to increase success (drivers) and to convert the barrier of Lean into factors to avoid.
- **Other frameworks within the research topic** – In order to understand the elements and standards within the field.
- **Change models** – In order to incorporate elements of change management into a Lean implementation framework, as there will be a changeover period.

Although there were a host of methods and approaches discovered during this SLR, it is imperative to note that there are each specific to the type of study that was conducted. Thus, each of the methods and approaches best suited for the following types of research are:

- **Transformation-flow-value (TFV)** – This method is ideal for a specific organisation, as it considers the process, flows and customer requirements.
- **Sociotechnical systems theory** – This method may be utilised for a generalised framework, as it allows for the integration and consideration of Human elements, working organisation, external environments and technology. Furthermore, this method may allow for the integration of different cultures.
- **Strategic management process model** – This method may be used for a generalised framework, as it allows for the development of a strategic plan.
- **Exploratory factor analysis** – This method may be utilised for a generalised framework, as it allows for the selection between various elements for the framework.
- **Surveying of experts for input** – This method may be utilised for a generalised framework, as it allows for the input (in terms of content and structure) from field experts.

Whilst conducting this SLR, various design elements were observed in the different frameworks. These design elements may be converted into design requirements, in order to guide future Lean framework designs. Therefore, it is recommended that the design elements be considered as requirements, in the following regard:

- **Surveying of experts for input** – It is advisable to allow experts to view and give feedback on the framework. This will allow for the input of their industry experience and may increase the chance of success for the framework.
- **Stage, phases or levels** – Majority of the frameworks incorporate stages, phases or levels. Therefore, it is recommended that future Lean frameworks utilise stages, phases or levels, in order to convey the complexity of the framework, or explain how to implement the framework on different levels of the organisation.
- **Aspects of Lean implementation** – It is suggested that future frameworks incorporate aspects of Lean implementation, as it will make using the framework easier for organisations.

- **Original Lean aspects** – Most of the frameworks contain original aspect of Lean, such as tools and techniques. This allows for keeping true to the original aspects, while developing a new framework. Thus, it is recommended that future frameworks consider this as a design requirement.
- **Drivers and barriers** – It is advisable to utilise drivers and barriers of Lean as a design requirement, because it enable one to develop a contingency plan for barriers whilst enhance drivers, for maximum chances of success.
- **Aspects of the research topic** – All of the frameworks found in the SLR make use of aspects of the research topic, as it enables them to stay true to the content of the research topic whilst designing the new framework. Ergo, it is suggested that future frameworks use this as a design requirement.
- **Aspects of change models** – It is recommended that frameworks utilise aspects of change models as a design requirement, because it will ease organisations into using the framework.

Some of the studies found during the SLR evaluated their designed frameworks. By conducting tests, researchers were able to verify and/or validate their frameworks. The following methods or approaches may be utilised for testing a framework:

- **Interviews** – This method is valuable when one needs to get feedback and open discussions about the framework.
- **Case studies of companies** – This method is ideal for implementing the framework in companies, however, may take significant time to show results and feedback about the framework.
- **Questionnaires** – This method will enable one to get statistical feedback on their framework, which may be incorporated into a redesign of the framework.
- **Computations** – This method allows for the testing of a framework by using mathematical models to test aspects of the framework against current framework.
- **Surveys** – This method will allow one to get feedback on their framework, which may be incorporated into a redesign of the framework.

This SLR study investigated the methods and design elements of Lean frameworks, however it is recommended that future research be done on the method and design elements of Lean models as well. While the SLR only focuses on Lean frameworks, it is therefore suggested that future studies investigate frameworks in general, which may allow for a fulsome overview and comparison of frameworks over various fields of study. This study concentrated on investigating studies that created Lean frameworks, ergo it is advised that future research explore the implementation strategies and outcomes of Lean frameworks.

By investigating and reporting on the methods and design elements utilised for Lean frameworks, this study allows for futures studies to utilise the *House of guidance for designing a Lean framework* (Figure 4) as an overview of the themes in Lean frameworks. Moreover, it could guide future studies on what content to investigate during literature studies in order to create a comprehensive Lean framework. Furthermore, this study may advise academics on appropriate design methods or approaches for creating their specific Lean implementation frameworks. Additionally, the design element highlighted in this paper may be utilised as requirements in future frameworks, and the methods to test design frameworks will allow researchers to validate and/or verify their creations. Lastly, it is recommended that future researchers add onto the House of guidance as and when they discover new important factors in the creation of Lean frameworks.

Finally, considering that Lean is ever-growing and has been adopted by various organisations, the question still stands as to why more than 90% of Lean implementations unsuccessful. Is it possible that researchers and practitioners are missing a fundamental part of Lean during implementation? From this SLR, it is evident that very little focus is placed on change management, moreover none of the studies found discussed Human factor engineering. Thus, it can be deduced that minute emphasis is placed on the Human factors, yet it contribute largely to Lean philosophy in the original literature (Liker et al., 2008). Ergo, it is strongly recommended that future studies focus on the Human factors involved in Lean, in order to address the missing link in its successful implementation.

Declaration of Conflicting Interests

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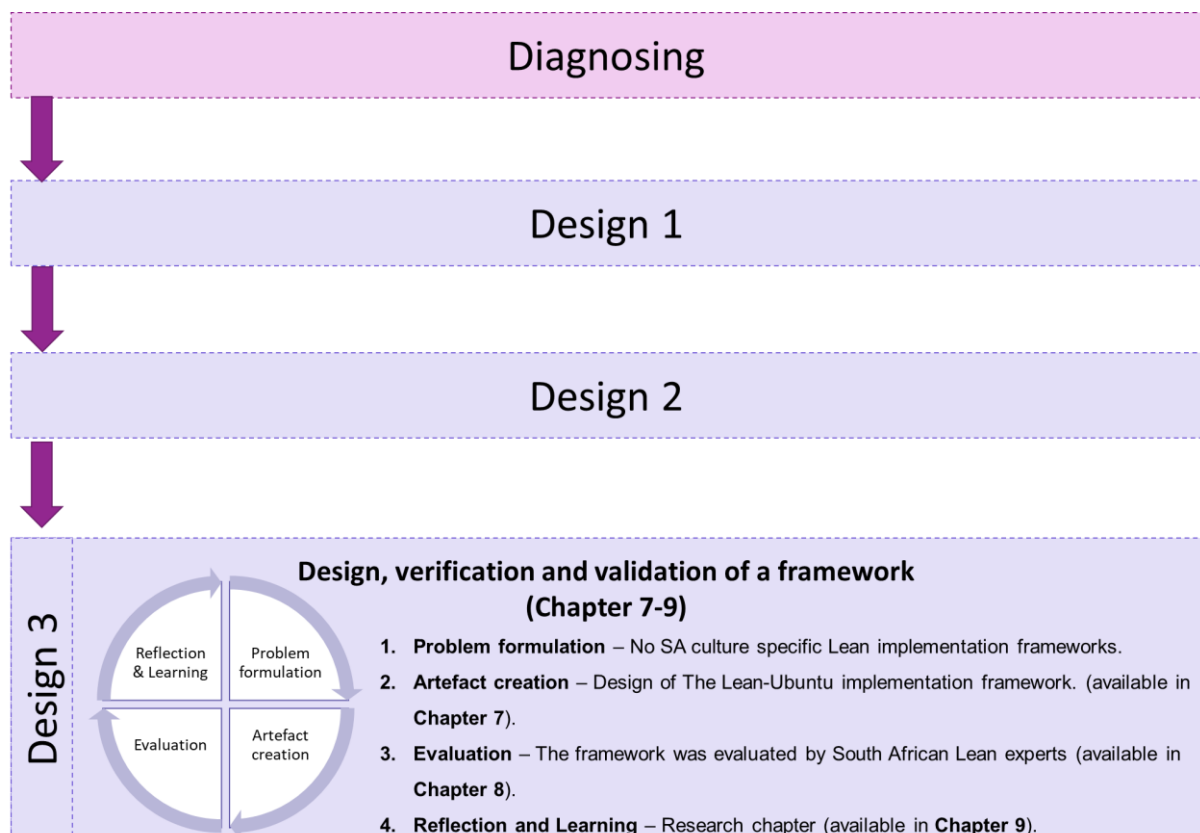


CHAPTER 7

Design of the Lean-Ubuntu implementation framework

This chapter guided the design and development of “the Lean-Ubuntu implementation framework”. This framework was designed by utilising the “House of guidance for designing a Lean framework” (Chapter 6) and incorporated the matching Lean and Ubuntu principles (Chapter 5). The framework offers a guideline for implementation of Lean in a South African organisation.

The work portrayed in chapter forms part of the design phase 3 of the research design, as can be seen in the diagram that follows.



7.1 Introduction

This chapter details the design process and creation of the Lean-Ubuntu implementation framework. The design process is illustrated in figure 16, the detail of which is presented in sections 7.2 to 7.5 that follow.

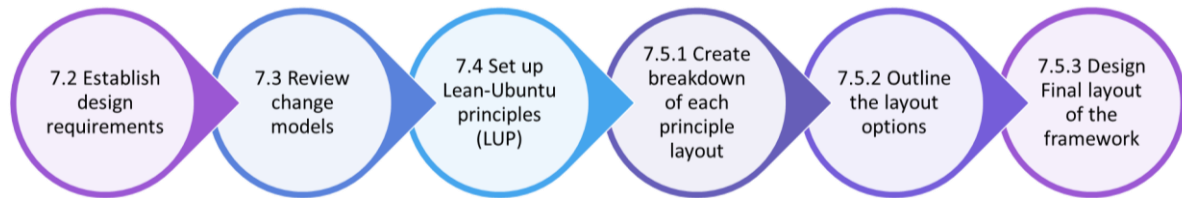


Figure 16: Design process

7.2 Design requirements

The design requirements (DR) were established as the first step of the design process. The following requirements established from Mangaroo-Pillay (2020) were included to guide the aesthetic of the framework:

- DR 1 – The framework should be simple in design
- DR 2 – The framework should be visually intuitive
- DR 3 – The framework should be legible

According to studies conducted by Aalbrecht et al. (1991) and Anand and Kodali (2009) frameworks must (a) depict an outline of a philosophy, (b) communicate a change process that should be adopted in order to achieve a new vision, and (c) compel different parties within an organisation to address a substantial list of key issues. Based on this, the following design requirements were set:

- DR 4 – The framework outlines a philosophy
- DR 5 – The framework adopts change processes
- DR 6 – The framework has different tasks for different parties (people)

In chapter 6, an article was presented that explored the design aspects found in existing frameworks. The paper presents the *House of guidance for designing a Lean framework*. This house was utilised to develop the following design requirements:

- DR 7 – The framework should include different stages, phases or levels
- DR 8 – The framework should include aspects of Lean implementation

- DR 9 – The framework should contain original aspects of Lean
- DR 10 – The framework should contain aspects of the research topic (Ubuntu)
- DR 11 – The framework should incorporate a change model
- DR 12 – The framework should not include any barriers to Lean implementation

7.3 Review of change models

Lean is seen as a cultural change; thus, it is important to incorporate change models into the design of a Lean implementation framework. Various change models were reviewed, as discussed in table 3 of chapter 2. After the review, it became apparent that Kotter's 8-step model for transformational change was best suited for the framework, as Lean requires an overall organisational transformation when implemented. However, in lieu of utilising the 8 steps, the three phases of the Kotter's model were used, as they cover a boarder range. The three phases of Kotter's change model to be utilised are:

- Phase 1 – Create a climate for change
- Phase 2 – Engage and enabling the organisation to change
- Phase 3 – Implementing and sustaining the change

7.4 Setting up the Lean-Ubuntu principles

In chapter 5, an article was presented that explored the relationship between Lean and Ubuntu. The article presented the Lean-Ubuntu analogy 2.0 capturing the correlations between the two management philosophies. The Lean-Ubuntu analogy was utilised to establish the name and order of the Lean-Ubuntu principles (LUP) as discussed in table 7.

It is important to note that the goal of these principles is not to replace the original Lean management principles, but rather to act as a bridge in understanding or explaining them in the South African context.

In the comment column of table 7, the discussion and rational for the order of the principles is captured. The main difference between the Ubuntu management philosophy and the Lean management philosophy is the foundation or starting principles. Lean starts with a basis of the philosophy, whereas Ubuntu starts with the people tier. However, when designing the Lean-Ubuntu principle it was important to start with the philosophy tier to provide a means of understanding Lean first and foremost. Thereafter, it is important to focus on the people tier, as South Africa (and the Ubuntu philosophy) is people-centred.

Table 7: Setting up the Lean-Ubuntu principles

Lean-Ubuntu Principle	Origin	Comment
1 – Create a long-term philosophy to reinforce loyalty and strong values	Lean principle 1 Ubuntu principle 7 and 12	Although Ubuntu has its foundation in people, it is important to create a long-term philosophy first to understand Lean
2 – Develop your teams and people (People-centred)	Lean principle 9 Ubuntu principle 3 and 4	While Lean first covers process then people. Ubuntu is a rooted in people, thus people was covered before processes
3 – Grow transformational leaders	Lean principle 11 Ubuntu principle 1,9,10 and 13	
4 – Openness with partners and suppliers	Lean principle 11 Ubuntu principle 6	
5 – Create continuous flow: The river flows where there is no obstacle	Lean principle 2 Ubuntu principle established in chapter 5 (interviews)	The process principles did not have corresponding principles in the original Ubuntu management philosophy. Thus, in chapter 5 interviews were conducted with Ubuntu experts to establish and name 5 new Ubuntu principles
6 – Use pull systems: Leave some for the ancestors	Lean principle 3 Ubuntu principle established in chapter 5 (interviews)	
7 – Level out workload: An elephant does not strain its trunk	Lean principle 4 Ubuntu principle established in chapter 5 (interviews)	
8 – Use Indabas: Build a culture of stopping to fix problems	Lean principle 5 Ubuntu principle established in chapter 5 (interviews)	
9 – Empower employees by using standardised tasks	Lean principle 6 Ubuntu principle 2	
10 – Visual control: The ancient art of storytelling for guidance	Lean principle 7 Ubuntu principle established in chapter 5 (interviews)	
11 – Only use reliable, tested technology to aid your people	Lean principle 8 Ubuntu principle 11	
12 – Explore operations to understand	Lean principle 12 Ubuntu principle 8	The problem-solving principles were kept in the original Lean philosophy order
13 – Utilise collective decision making	Lean principle 13 Ubuntu principle 8	
14 – Create a learning organisation	Lean principle 14 Ubuntu principle 5 and 10	

7.5 Conceptual design of the framework

The conceptual design of the framework consists of the design for each level (principle) layout, the design of the outline of the framework and then the final layout of the framework.

7.5.1 Breakdown of each principle layout

As discussed in section 7.4, there are 14 Lean-Ubuntu principles. The goal of these principles is to guide the implementation of Lean in South African organisations by incorporating the Ubuntu philosophy. Each of the 14 principles will need to be executed on different levels of business.

Ergo, the three main levels of business execution are utilised (strategic, tactical and operational levels). Every Lean-Ubuntu principle must also incorporate instructions for the three phases of Kotter's change model. Therefore, a matrix-style block will be utilised for each of the 14 principles, showcasing the different instructions for the implementation at the different levels of business and different phases of change. Figure 17 illustrates the generic layout of the block for a Lean-Ubuntu principle.

LUP X		Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. →	1.2.	1.3.
	Tactical (Supervisors)	2.1. →	2.2.	2.3.
	Operational (Floor workers)	3.1. →	3.2.	3.3.

Figure 17: Layout of the Lean-Ubuntu principles

In figure 17, the arrows illustrate the direction of progress, while the green *LUP X* block depicts the Lean-Ubuntu principles number. Each row starts with phase 1 of the change model and moves to phase 3 upon accomplishing the task. The change is also initiated from the top-down in an organisation, thus starting with upper management at a strategic level (as illustrated by the vertical arrow).

7.5.2 Outline for framework layout options

Each principle was allocated a block detailing the implementation instructions as discussed in section 7.5.1. However, the outline of the framework required a design that incorporated the different tiers of Lean-Ubuntu. As previously mentioned, the Lean philosophy starts with a foundation on long-term philosophy, whereas Ubuntu starts with a strong base of people. Therefore, the Lean-Ubuntu implementation framework needs to emphasis a base (starting point) of both philosophy and people; thereafter, moving to process and lastly problem-solving.

It was important to ensure that the design of the Lean-Ubuntu implementation framework is seen as a symbol of South Africa. Ergo, three design options were brainstormed:

- A. Baobab tree – An iconic African tree often used in African designs
- B. African Hut – A house structure
- C. 3 legged potjie pot – A pot used to cook outside on an open fire

Each of the three options were sketched out using the layout outline of people and philosophy as the foundation (figure 18). From the sketches in figure 18, the best suited option was selected (the African hut). The African Hut was the best choice as it could be likened to the Toyota production system house (a Lean symbol), with it being an African house.

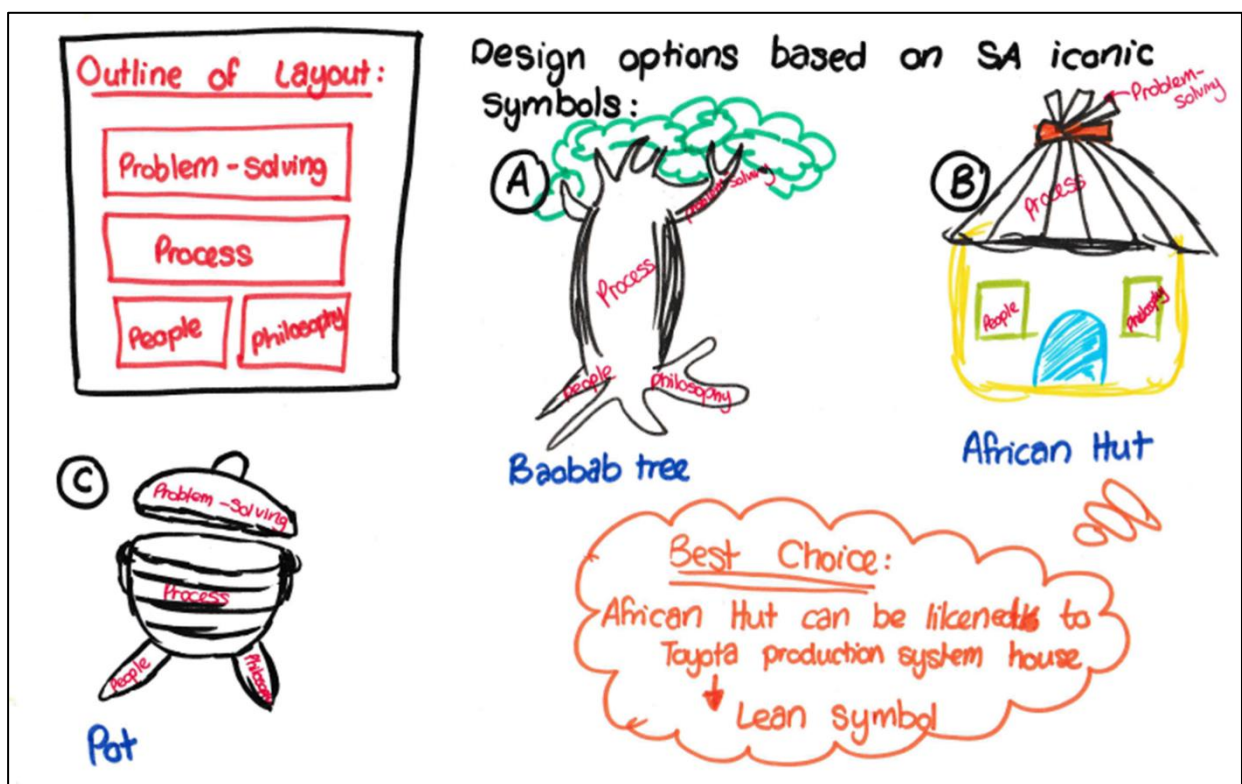


Figure 18: Sketch of the design options for the layout of the framework

7.5.3 Final layout of the framework

After selecting the African hut as the layout for the framework, it was populated with the different Lean-Ubuntu principles. Figure 19 illustrates the Lean-Ubuntu house (hut), which was the outline for principles. The different tiers (philosophy, people, process and problem-solving) are indicated. Moreover, various icons or symbols were allocated to each principle, to visually summarise the

principle. This may aid in understanding and remembering the meaning and requirement for each principle and/or assist illiterate employees in understanding.

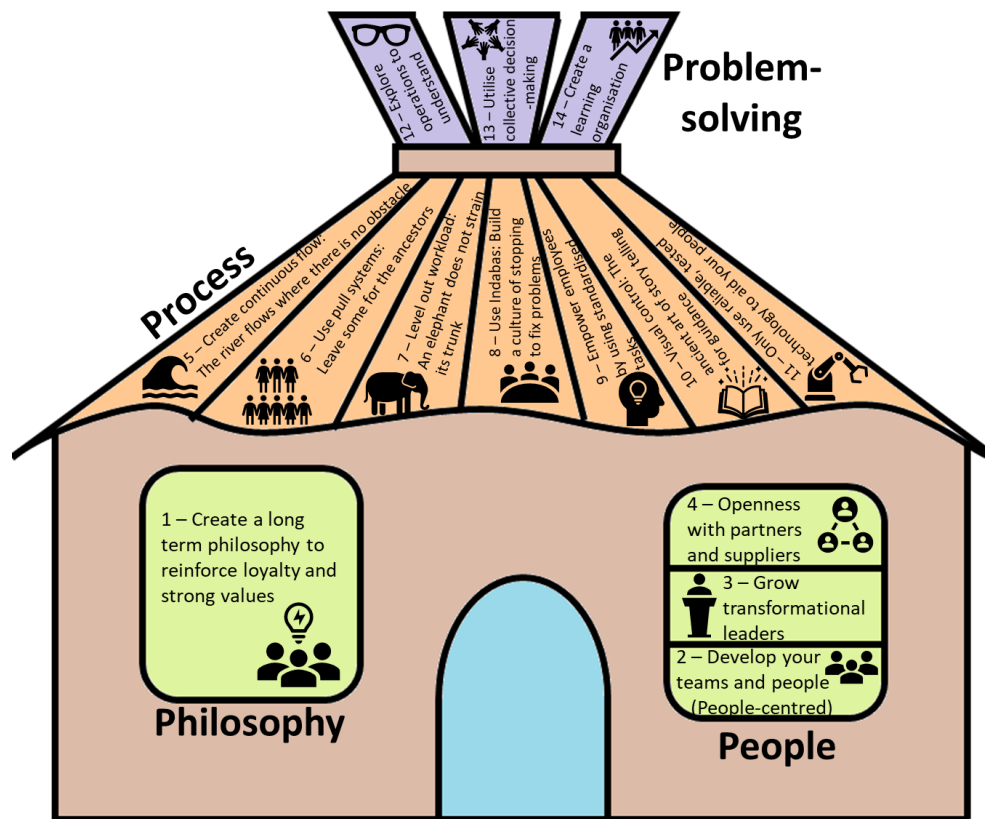
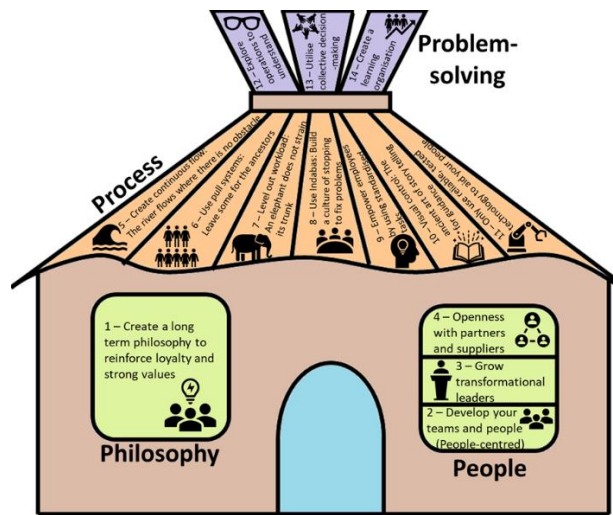


Figure 19: The Lean-Ubuntu house(hut)

7.6 The Lean-Ubuntu implementation framework

Considering the design requirements stipulated in section 7.2, the Lean-Ubuntu implementation framework was created. It incorporates the Lean-Ubuntu house(hut) from figure 19, to provide an overview of the principles and how they fit into the grand scheme of things. The framework also dictates the instruction for each principle in the format of the block layout in figure 17. It is important to note that the detail of each principle was created by incorporating prior research (chapter 5) and by including relevant practical aspects of Lean implementation as explained in the Toyota way fieldbook (Liker and Meier, 2006). The Toyota way fieldbook discusses each of the 14 principles of Lean management (as covered in section 2.2.2). The overview of the Lean-Ubuntu implementation framework is presented in figure 20. It is important to note that not all principles require commitment from all departments, as some may only focus on upper management. Due to this, some of the blocks in the framework are greyed out. Thereafter, sections 7.6.1 to 7.6.14 discuss the detailed implementation strategies for each principle.



	Business execution levels	Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
LUP 1 – Create a long term philosophy to reinforce loyalty and strong values	Strategic (Upper management)	Establish the company's purpose and vision based on current company culture and Lean culture.	Communicate the company's purpose and vision.	Host workshops and events for defining and exploring the company's purpose and vision. (Cultivate the culture)
	Tactical (Supervisors)		Recognise and acknowledge employee commitment to the culture	Promote a caring environment and live the company vision
	Operational (Floor workers)		Recognise and acknowledge other employee's commitment to the culture	Understand and promote the company vision and purpose
LUP 2 – Develop your teams and people for a people-centred work culture	Strategic (Upper management)	Motivate employees. Create opportunities for growth and development of your people	Share training opportunities with employees	Track performance and create promotion opportunities
	Tactical (Supervisors)	Form personal development teams with other employees	Attend and/or complete training opportunities	Teach new skills to other members of your team. Track performance
	Operational (Floor workers)	Form personal development teams with other employees	Attend and/or complete training opportunities	Teach new skills to other members of your team
LUP 3 – Grow transformational leaders, who understand the work and mentor other	Strategic (Upper management)	Recognise internal employees for leadership roles	Give employees the opportunity to take on leadership roles	Strengthen people-centredness
	Tactical (Supervisors)		Attend and/or complete training opportunities	Strengthen people-centredness. Support operations. Promote the system. Lead change. Inspire others
	Operational (Floor workers)		Attend and/or complete training opportunities	Support operations. Promote the system. Lead change. Inspire others
LUP 4 – Foster openness with your partners and suppliers, in order to respect and challenge them	Strategic (Upper management)	Create openness with your partners and suppliers. Challenge your suppliers.	Communicate with each other. Share information. Set target for partners and suppliers.	Develop suppliers. Have mutual understanding. Learn from each other.
	Tactical (Supervisors)			
	Operational (Floor workers)			
LUP 5 – Create continuous flow: The river flows where there is no obstacle	Strategic (Upper management)	Develop a single piece flow plan	Use visual control to promote and support the plan	Implement single piece flow and conduct Lean audits occasionally.
	Tactical (Supervisors)	Establish connected processes and takt times	Introduce Kanbans and redesign layouts to support the changes	Utilise Kanbans and head problem solving teams. Monitor takt times and improvements
	Operational (Floor workers)	Join problem solving teams	Identify problems, get to know the new tools (kanbans etc)	Utilise single piece flow. Investigate problems
LUP 6 – Use pull systems: Leave some for the ancestors	Strategic (Upper management)	Define agreements with specific limits for product volume between suppliers and customers	Identify problems that are shared between parties to them (resources, storage etc)	Implement visually apparent and physically constrained control methods.
	Tactical (Supervisors)			JIT System - Aim to remove kanbans overtime and link process steps with no inventory.
	Operational (Floor workers)		Understand Pull techniques and aim to achieve product limits	Work on reducing kanbans
LUP 7 – Level out the workload: An elephant does not strain its trunk	Strategic (Upper management)	Establish that levelling is an enterprise wide process	Explain and discuss wastes	Aim to reduce wastes
	Tactical (Supervisors)	Identify the most important items (with greatest benefits). Identify multiples for the level pattern	Display a schedule that dictates replenishment and sets a pitch based on current conditions	Implement new standards based on new schedules and takt times
	Operational (Floor workers)		Organise product volume, mix and sequence	Identify and reduce wastes. Work based on the schedule
LUP 8 – Use Indabas: Build a culture of stopping to fix problems	Strategic (Upper management)	Pay attention to the respect and dignity of the people	Define the roles and procedures for response to problems	Have designated people for response to line stops. Conduct timely quality audits
	Tactical (Supervisors)	Establish a practical degree of stability in processes	Make sure a method to stop the line is understood and accessible to all employees.	Make use of visual control, standardised work, jidoka and poke-yoke
	Operational (Floor workers)	Understand the process to stop the line. Know the exact points of the problem	Learn to solve problems and make it a need to fix issues	Conduct self-inspection and report problems. Fix issues at the source.
LUP 9 – Empower employees by using standardised tasks	Strategic (Upper management)	Create a structure to support standardised work. Establish that standardised tasks are the starting point for continuous improvement	Create documentation for standard work	Provide examples and training opportunities
	Tactical (Supervisors)	Establish defined expectations for different tasks	Install performance boards and andons	Create a repeatable work method. Install visual management indicators
	Operational (Floor workers)		Attend training and understand the requirements for "perfect products and tasks"	Follow stands for tasks and monitor performance
LUP 10 – Visual control: The ancient art of storytelling for guidance	Strategic (Upper management)	Understand the details needed for visual control and story telling	Role out 5s within the organisation while facilitating communication	Develop visuals and stories about standards
	Tactical (Supervisors)		Make standards visible and tell stories about them.	Teach 5s and monitor standards
	Operational (Floor workers)	Understand the standard and learn 5s	Investigate or inspect work to report deviations. Talk about standards with others	Implement 5s. Correct deviations.
LUP 11 – Only use reliable, tested technology to aid your people	Strategic (Upper management)	Start a conversation about new technologies that may be introduced	Allow for training opportunities	Test technology before allowing others to use it. Manage support systems for new technology
	Tactical (Supervisors)	Create cross-functional teams	Attend training and understand the new technologies	Participate in pilot tests of technology. Explain your understanding with others
	Operational (Floor workers)	Join cross-functional teams	Attend training and understand the new technologies	Participate in pilot tests of technology. Explain your understanding with others
LUP 12 – Explore the operations to understand the problem	Strategic (Upper management)	Create cross-functional teams and rewards systems	Give opportunities for training cross-functional teams and kaizen management	Provide support for employees and regularly conduct Gemba walks
	Tactical (Supervisors)	Join a cross-functional team and attend training	Take the opportunity to explain work problems to others. Discuss possible solutions	Provide support for employees and regularly conduct Gemba walks
	Operational (Floor workers)	Join a cross-functional team and attend training	Take the opportunity to explain work problems to others. Discuss possible solutions	Conduct problem solving in cross-functional teams
LUP 13 – Utilise collective decision making	Strategic (Upper management)	Create opportunities for regular group meetings	Differentiate between short-term and long-term issues	Start small problem solving projects with employees
	Tactical (Supervisors)	Attend group meeting and highlight problems	Solve problems by utilising the PDCA cycle and 5-why analysis in problem solving teams	Display outcomes of projects with A3 reports and build consensus with us for group decisions
	Operational (Floor workers)	Attend group meeting and highlight problems	Solve problems by utilising the PDCA cycle and 5-why analysis in problem solving teams	Display outcomes of projects with A3 reports and build consensus with us for group decisions
LUP 14 – Create a learning organisation via reflection and continuous improvement	Strategic (Upper management)	Create the environment for participation, accountability, commitment and structure	Provide opportunities for participating in and communicating kaizen projects	Reflect on the improvements
	Tactical (Supervisors)	Be aware of areas for improvement. Learn to learn. Understand that improvements happen in small steps	Utilise Hoshan Kanri to design improvement plans.	Participating in and communicating kaizen projects
	Operational (Floor workers)	Be aware of areas for improvement. Learn to learn. Understand that improvements happen in small steps	Utilise Hoshan Kanri to design improvement plans	Participating in and communicating kaizen projects

Figure 20: The Lean-Ubuntu implementation framework

7.6.1 Lean-Ubuntu principle 1

For the first principle of the framework, it was important to start with the creation of a long-term philosophy (akin to the original Lean principles). However, it was vital to reinforce the loyalty and strong organisational value (akin to Ubuntu principles).

Thus, this principle starts with upper management introducing Lean and establishing the company vision, in order to create a climate for change within the organisation. They will also need to communicate these changes by hosting workshops and other events. This will allow all employees to understand the new culture and promote a better environment. The detail of this principle is illustrated in the block layout of figure 21.

LUP 1 – Create a long term philosophy to reinforce loyalty and strong values		Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Establish the company's purpose and vision based on current company culture and Lean culture.	1.2. Communicate the company's purpose and vision.	1.3. Host workshops and events for defining and exploring the company's purpose and vision. (Cultivate the culture)
	Tactical (Supervisors)		2.2. Recognise and acknowledge employee commitment to the culture	2.3. Promote a caring environment and live the company vision
	Operational (Floor workers)		3.2. Recognise and acknowledge other employee's commitment to the culture	3.3. Understand and promote the company vision and purpose

Figure 21: Block layout for LUP 1

7.6.2 Lean-Ubuntu principle 2

For the second principle of the framework, it was essential to develop teams and people (similar to Ubuntu principles) as South African has a people-centred work culture that needs to be upheld.

Ergo, this principle starts with upper management motivating employees and creating opportunities for growth and development. This will allow employees to form personal development teams and attend training. Thereafter, employees are required to share skills with other team members and track their performance. The detail of this principle is illustrated in the block layout of figure 22

LUP 2 – Develop your teams and people for a people-centred work culture		Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Motivate employees Create opportunities for growth and development of your people	1.2. Share training opportunities with employees	1.3. Track performance and create promotion opportunities
	Tactical (Supervisors)	2.1. Form personal development teams with other employees	2.2. Attend and/or complete training opportunities	2.3. Teach new skills to other members of your team Track performance
	Operational (Floor workers)	3.1. Form personal development teams with other employees	3.2. Attend and/or complete training opportunities	3.3. Teach new skills to other members of your team

Figure 22: Block layout for LUP 2

7.6.3 Lean-Ubuntu principle 3

For the third principle of the framework, the growth of transformational leaders was required (similar to Ubuntu and Lean principles) as organisational leaders will drive the change if they understand the benefits. This would create more buy-in from employees if the change is driven by one of their fellow employees. Moreover, this helps them understand that there is room for growth with the organisation.

Ergo, this principle starts with upper management recognising internal employees for leadership roles, in turn this will strengthen the people centredness. Once employees are given the opportunity to take on leadership roles, they will be able to support operations and lead others. The detail of this principle is illustrated in the block layout of figure 23.

LUP 3 – Grow transformational leaders, who understand the work and mentor other		Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Recognise internal employees for leadership roles	1.2. Give employees the opportunity to take on leadership roles	1.3. Strengthen people-centredness
	Tactical (Supervisors)		2.2. Attend and/or complete training opportunities	2.3. Strengthen people-centredness. Support operations. Promote the system. Lead change. Inspire others
	Operational (Floor workers)		3.2. Attend and/or complete training opportunities	3.3. Support operations. Promote the system. Lead change. Inspire others

Figure 23: Block layout for LUP 3

7.6.4 Lean-Ubuntu principle 4

For the fourth principle of the framework, openness will need to be fostered with the partners and suppliers of the organisation (similar to Lean and Ubuntu principles). This would create a better relationship with the partners and suppliers, who are seen as the extended network of an organisation according to Lean.

Therefore, this principle requires upper management to create openness with partners and suppliers and challenge them to grow. It is important to set targets and share information during this process. This will allow for mutual understanding and provide the opportunity to learn from each other. The detail of this principle is illustrated in the block layout of figure 24.

LUP 4 – Foster openness with your partners and suppliers, in order to respect and challenge them		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Create openness with your partners and suppliers. Challenge your suppliers.	1.2. Communicate with each other. Share information . Set target for partners and suppliers.	1.3. Develop suppliers. Have mutual understanding. Learn from each other.
	Tactical (Supervisors)			
	Operational (Floor workers)			

Figure 24: Block layout for LUP 4

7.6.5 Lean-Ubuntu principle 5

For the fifth principle of the framework, it is imperative to create continuous flow within the organisational process (similar to Lean principles).

Thus, this principle requires upper management to create a single piece flow plan and conduct Lean audits to inspect the state of processes. Supervisors would be responsible for establishing takt times and connection between processes. At an operational level, floor workers would utilise single piece flow and investigate problems around it. The detail of this principle is illustrated in the block layout of figure 25.

LUP 5 – Create continuous flow: The river flows where the is no obstacle		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Develop a single piece flow plan	1.2. Use visual control to promote and support the plan	1.3. Implement single piece flow and conduct Lean audits occasionally.
	Tactical (Supervisors)	2.1. Establish connected processes and takt times	2.2. Introduce kanbans and redesign layouts to support the changes	2.3. Utilise kanbans and head problem solving teams. Monitor takt times and improvements
	Operational (Floor workers)	3.1. Join problem solving teams	3.2. Identify problems, get to know the new tools (kanbans etc)	3.3. Utilise single piece flow. Investigate problems

Figure 25: Block layout for LUP 5

7.6.6 Lean-Ubuntu principle 6

For the sixth principle of the framework, it is important to utilise pull systems within the organisation (similar to Lean principles). This would reduce inventory and aid in achieving production limits.

Therefore, this principle begins with the definition of production volumes between suppliers and customers. At a tactical level, JIT systems will be implemented. Floor workers are required to understand pull techniques and work on achieving production limits. The detail of this principle is illustrated in the block layout of figure 26.

LUP 6 – Use pull systems: Leave some for the ancestors		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Define agreements with specific limits for product volume between suppliers and customers	1.2. Dedicate items that are shared between parties to them (resources, storage etc)	1.3. Implement visually apparent and physically constrained control methods.
	Tactical (Supervisors)			2.3. JIT System - Aim to remove kanbans overtime and link process steps with no inventory.
	Operational (Floor workers)		3.2. Understand Pull techniques and aim to achieve product limits	3.3. Work on reducing kanbans

Figure 26: Block layout for LUP 6

7.6.7 Lean-Ubuntu principle 7

For the seventh principle of the framework, levelling out the workload can begin (similar to Lean principles). This would reduce wastes and improve the scheduling of an organisation.

Ergo, this principle begins with understanding that levelling is a company-wide process. At a tactical level, important items will be identified, replenishment schedules need to be displayed and new standards must be implemented. Floor workers will organise production volumes, work base on the schedule and reduce wastes. The detail of this principle is illustrated in the block layout of figure 27.

LUP 7 – Level out the workload: An elephant does not strain its trunk		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Establish that levelling is an enterprise wide process	1.2. Explain and discuss wastes	1.3. Aim to reduce wastes
	Tactical (Supervisors)	2.1. Identify the most important items(with greatest benefits). Identify multiples for the level pattern	2.2. Display a schedule that dictates replenishment and sets a pitch based on current conditions	2.3. Implement new standards based on new schedules and takt times
	Operational (Floor workers)		3.2. Organise product volume, mix and sequence	3.3. Identify and reduce wastes. Work based on the schedule

Figure 27: Block layout for LUP 7

7.6.8 Lean-Ubuntu principle 8

For the eighth principle of the framework, building a culture of stopping to fix problem is essential (similar to Lean principles). This would decrease the number of defects and increase production time.

Thus, this principle starts with upper management focusing on respect and dignity. It is important to define the roles of all employees and have designated people for responding to line stops. On a tactical level, supervisors need to reinforce the understanding of methods to stop the line. Floor workers will learn to solve problems and fix issues at the source. The detail of this principle is illustrated in the block layout of figure 28.

LUP 8 – Use Indabas: Build a culture of stopping to fix problems		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Pay attention to the respect and dignity of the people	1.2. Define the roles and procedures for response to problems	1.3. Have designated people for response to line stops. Conduct timely quality audits
	Tactical (Supervisors)	2.1. Establish a practical degree of stability in processes	2.2. Make sure a method to stop the line is understood and accessible to all employees.	2.3. Make use of visual control, standardised work, jidoka and poke- yoke
	Operational (Floor workers)	3.1. Understand the process to stop the line. Know the exact points of the problem	3.2. Learn to solve problems and make it a need to fix issues	3.3. Conduct self- inspection and report problems. Fix issues at the source.

Figure 28: Block layout for LUP 8

7.6.9 Lean-Ubuntu principle 9

For the ninth principle of the framework, it is important to empower employees by using standardised tasks (similar to Lean principles and Ubuntu principles). This would allow organisations to maintain predictability, timing and outputs.

Thus, this principle starts with upper management creating a structure to support standardised work, creating documentation for standard work and providing training opportunities. Supervisors will be responsible for creating repeatable work methods and floor workers will attend training and follow the new standards. The detail of this principle is illustrated in the block layout of figure 29.

LUP 9 – Empower employees by using standardised tasks		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Create a structure to support standardised work. Establish that standardised tasks are the starting point for continues improvement	1.2. Create documentation for standard work	1.3. Provide examples and training opportunities
	Tactical (Supervisors)	2.1. Establish defined expectations for different tasks	2.2. Install performance boards and andons	2.3. Create a repeatable work method. Install visual management indicates
	Operational (Floor workers)		3.2. Attend training and understand the requirements for “perfect products and tasks”	3.3. Follow stands for tasks and monitor performance

Figure 29: Block layout for LUP 9

7.6.10 Lean-Ubuntu principle 10

For the tenth principle of the framework, visual control will be implemented (similar to Lean principles). However, storytelling will be utilised for guidance for employees (akin to Ubuntu teachings). This would allow organisations to transfer understanding and knowledge faster.

Ergo, this principle starts with upper management understanding the details needed for visual control and storytelling. Thereafter, visuals and stories need to be developed about standards. At a tactical level, 5s will be taught and standards will be monitored. Operationally, 5s will be implemented and deviations in production will be corrected. The detail of this principle is illustrated in the block layout of figure 30.

LUP 10 – Visual control: The ancient art of storytelling for guidance		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Understand the details needed for visual control and story telling	1.2. Role out 5s within the organisation while facilitating communication	1.3. Develop visuals and stories about standards
	Tactical (Supervisors)		2.2. Make standards visible and tell stories about them.	2.3. Teach 5s and monitor standards
	Operational (Floor workers)	3.1. Understand the standard and learn 5s	3.2. Investigate or inspect work to report deviations. Talk about standards with others	3.3. Implement 5s. Correct deviations.

Figure 30: Block layout for LUP 10

7.6.11 Lean-Ubuntu principle 11

For the eleventh principle of the framework, it is vital to only use technology to aid people (similar to Lean and Ubuntu principles). This would allow organisations to grow technologically, with minimal resistance from employees.

Ergo, this principle starts with upper management exposing employees to new technology, that has been tested. Employees will join cross-functional teams to attend training and share their knowledge and understanding with others. The detail of this principle is illustrated in the block layout of figure 31.

LUP 11 – Only use reliable, tested technology to aid your people		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Start a conversation about new technologies that may be introduced	1.2. Allow for training opportunities	1.3. Test technology before allowing others to use it. Manage support systems for new technology
	Tactical (Supervisors)	2.1. Create cross-functional teams	2.2. Attend training and understand the new technologies	2.3. Participate in pilot tests of technology. Explain your understanding with others
	Operational (Floor workers)	3.1. Join cross-functional teams	3.2. Attend training and understand the new technologies	3.3. Participate in pilot tests of technology. Explain your understanding with others

Figure 31: Block layout for LUP 11

7.6.12 Lean-Ubuntu principle 12

For the twelfth principle of the framework, the operations should be explored to understand problems (similar to Lean and Ubuntu principles). This would allow management to understand what occurs at the ground level of the organisation and give employees a chance to have a voice in solutions.

Ergo, this principle starts with the formation of cross-functional teams. Employees should attend training session in teams and understand the problems within an organisation. During Gemba walks, management should give employees an opportunity to explain problems and how they would solve it. The detail of this principle is illustrated in the block layout of figure 32.

LUP 12 – Explore the operations to understand the problem		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Create cross-functional teams and rewards systems	1.2. Give opportunities for training cross-functional teams and kaizen management	1.3. Provide support for employees and regularly conduct Gemba walks
	Tactical (Supervisors)	2.1. Join a cross-functional team and attend training	2.2. Take the opportunity to explain work problems to others. Discuss possible solutions	2.3. Provide support for employees and regularly conduct Gemba walks
	Operational (Floor workers)	3.1. Join a cross-functional team and attend training	3.2. Take the opportunity to explain work problems to others. Discuss possible solutions	3.3. Conduct problem solving in cross-functional teams

Figure 32: Block layout for LUP 12

7.6.13 Lean-Ubuntu principle 13

For the thirteenth principle of the framework, organisations will use collective decision making (similar to Lean and Ubuntu principles). This would allow organisations to consider the voice of employees in decision making.

Ergo, this principle starts with regular group meetings to highlight problems within the organisation. Subsequently, employees will solve problems in teams and build consensus for group decisions on solutions. The detail of this principle is illustrated in the block layout of figure 33.

LUP 13 – Utilise collective decision making		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Create opportunities for regular group meetings	1.2. Differentiate between short-term and long-term issues	1.3. Start small problem solving projects with employees
	Tactical (Supervisors)	2.1. Attend group meeting and highlight problems	2.2. Solve problems by utilising the PDCA cycle and 5-why analysis in problem solving teams	2.3. Display outcomes of projects with A3 reports and build consensus with others for group decisions
	Operational (Floor workers)	3.1. Attend group meeting and highlight problems	3.2. Solve problems by utilising the PDCA cycle and 5-why analysis in problem solving teams	3.3. Display outcomes of projects with A3 reports and build consensus with others for group decisions

Figure 33: Block layout for LUP 13

7.6.14 Lean-Ubuntu principle 14

For the fourteenth principle of the framework, organisations will create a learning environment via reflection and continuous improvement (similar to Lean and Ubuntu principles). This would allow organisations to continuously grow and improve operations.

Ergo, this principle begins with the creation of a learning environment, where employees have the opportunity to be a part of kaizen projects. The detail of this principle is illustrated in the block layout of figure 34.

LUP 14 – Create a learning organisation via reflection and continuous improvement		Change model phases		
		Creating a climate for change	Engagement and enabling the organisation	Implementing and sustaining the change
Business execution levels	Strategic (Upper management)	1.1. Create the environment for participation, accountability, commitment and structure	1.2. Provide opportunities for participating in and communicating kaizen projects	1.3. Reflect on the improvements
	Tactical (Supervisors)	2.1. Be aware of areas for improvement. Learn to learn. Understand that improvements happen in small steps	2.2. Utilise Hoshan Kanri to design improvement plans.	2.3. Participating in and communicating kaizen projects
	Operational (Floor workers)	3.1. Be aware of areas for improvement. Learn to learn. Understand that improvements happen in small steps	3.2. Utilise Hoshan Kanri to design improvement plans	3.3. Participating in and communicating kaizen projects

Figure 34: Block layout for LUP 14

7.7 Chapter summary

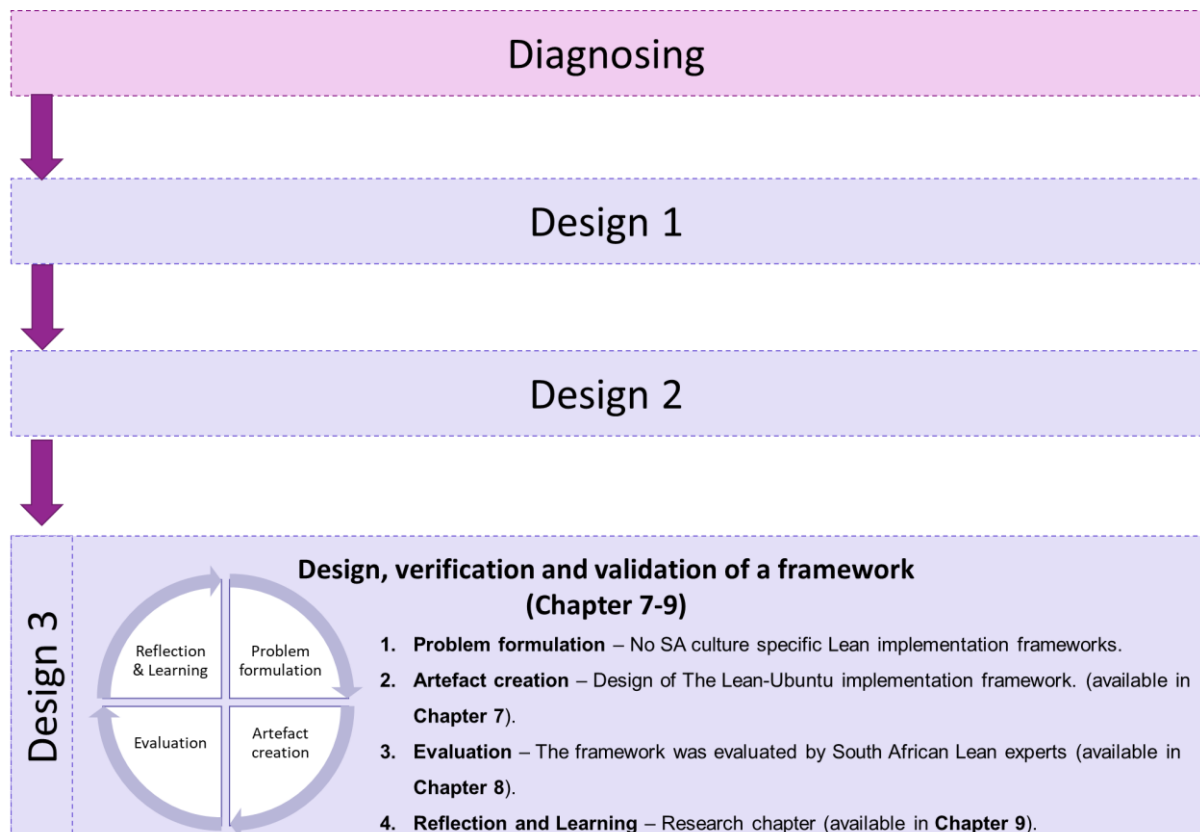
This chapter showcased the design process for the framework, as well as the detailed design of the Lean-Ubuntu framework.

CHAPTER 8

Survey Design and Framework evaluation

This chapter evaluated “the Lean-Ubuntu implementation framework” by means of surveys. This chapter discusses the design of the survey, the administration and the results obtained from it. Thereafter, the framework was updated to incorporate suggested changes.

The work portrayed in this chapter forms part of the design phase 3 of the research design, as can be seen in the diagram that follows.



8.1 Introduction

In chapter 7, the detailed design of the Lean-Ubuntu implementation framework was discussed. In this chapter, the design of the survey used to evaluate the framework will be explored.

8.2 Selection of panel of experts

For the survey, purposive sampling was utilised to obtain participants as they were selected for a predetermined reason, being Lean experts (De Vos et al., 2011a, Nordin et al., 2012b, Skulmoski et al., 2007). The selected panel of participants was a heterogeneous group comprised of Lean experts from industry and academia. This sampling strategy was further coupled with snowball sampling in order for experts to identify fellow experts in the field (De Vos et al., 2011a). Literature (De Vos et al., 2011a, Nordin et al., 2012b, Skulmoski et al., 2007) suggest that there is flexibility in qualitative research with regards to sample sizes. Considering the aforementioned recommendation, the researcher aimed to conduct interviews until data saturation was reached with experts or as much as can be permitted by the limitation of experts. In addition to the aforementioned, the following inclusion criteria were established based on similar criteria from Coetzee (2018) and Mangaroo-Pillay (2020):

- a) Operative communication skills
- b) Inclination and ability to partake in the study
- c) Adequate time to partake
- d) Expert knowledge and experience in Lean management in South Africa

When conducting the survey, 36 prospective participants were identified and invited to partake in the study. From the prospective sample, 18 participants responded, thereby providing a 47.22% response rate. The sample distribution of participant experience levels is illustrated in figure 35.

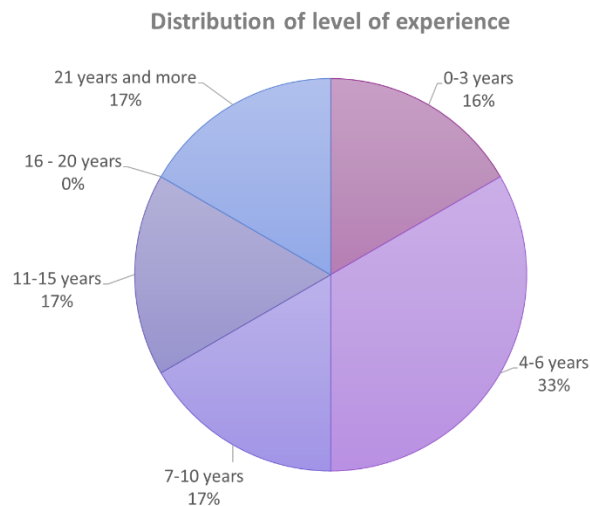


Figure 35: Pie chart of level of experience distribution

8.3 Administration procedure

An online survey was administered using a google form, with a video presentation of the Lean-Ubuntu implementation framework and an informed consent overview. A link to the survey was emailed to potential participants.

The email explained that participants would be required to spend approximately 45 minutes on this survey as they were required to watch a 24-minute video prior to completing the survey. The video depicted the framework and discussed the various principles as explained in chapter 7. After 2 weeks, a reminder email was sent out to individuals who did not respond to the initial email by the deadline.

8.4 Survey construction

In order to evaluate the framework, a self-administered or individually-administered survey was utilised, ergo allowing participants to complete it themselves at a convenient time for them (Sinkowitz-Cochran, 2013). The survey was composed of scaled, closed-ended statements (questions), thus requiring participants to rate their level of agreement to the provided statements (Sinkowitz-Cochran, 2013, De Vos et al., 2011b). Furthermore, a comment section was included in the survey, giving participants a platform to provide any additional commentary they deem fit.

8.4.1 Survey design requirements

Based on the literature covered in chapter 2 (section 2.5.7), a checklist was set out to guide the design of the survey. All the design requirements were adhered to while designing the survey, as is evident by the checklist in table 8.

Table 8: Survey design requirements checklist

Survey design requirement	Achieved
1. Format of the survey should be uncluttered and well spread	✓
2. Instructions should be included	✓
3. A thank you message should be included at the end of the survey	✓
4. One should make use of a pre-existing scale for responses	✓
5. Statements should not be vague or ambiguous	✓
6. Statements should not be leading or persuasive	✓
7. Statements should not contain unexplained jargon or acronyms	✓
8. Statements should be as few as possible	✓
9. Statements should as short as possible	✓
10. Statements should not double-barrelled	✓
11. Grouping should be utilised for compartmentalising statements	✓
12. Surveys should maintain anonymity and confidentiality of the participants	✓
13. Statements should be composed in simple and basic English, & pitched at the right level	✓
14. Each statement should be relevant to the validation and verification process	✓

8.4.2 Scale of choice

According to multiple sources, a Likert scale is best suited for ranking agreement levels of survey participants (Bryman and Bell, 2016, De Vos et al., 2011b, Fanning, 2005, Kelley et al., 2003, OECD, 2012, Sinkowitz-Cochran, 2013). For the purpose of this survey, a 5 point Likert scale was utilised, as captured in table 9.

Table 9: Likert scale for survey

(1)	(2)	(3)	(4)	(5)
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

8.4.3 Defining consensus

Although this study did not follow the Delphi method, the Delphi consensus definition was utilised. Ergo, consensus amongst participants was reached if the minimum average percentage for that statement was greater than 75%. Practically, this was a measure of 3.75 on the 5 point Likert scale (Nordin et al., 2012b). When consensus was achieved, it was accepted that survey statement was verified or validated.

In a case where consensus was not reached for a survey statement, the qualitative feedback (comments) were analysed in order to understand why consensus was not achieved and to address any shortcomings that were mentioned. The shortcomings were discussed and addressed, resulting in the updated framework (presented in section 8.7).

8.4.4 Survey statements design

The survey was designed with a specific goal of evaluating the Lean-Ubuntu implementation framework. In order to achieve this goal, table 10 was created to verify and/or validate the following areas:

- Verify design requirements (**DR**) of the framework
- Validate problem statement (**PS**)
- Prove the artefact is valid (address the problem)
- Verify applicability of the artefact
- Verify novelty of the artefact

Table 10 explores each of the aforementioned objectives' elements and which survey statements were developed in that area (Mangaroo-Pillay, 2020, De Vos et al., 2011b).

Table 10: Development of survey statements

Objective	Elements	Survey statements
Verify design requirements (DR) of the framework	DR 1 – Simple in structure DR 2 – Visually intuitive DR 3 – Legible DR 4 – Outline of a philosophy DR 5 – Change process to be adopted DR 6 – Different parties have tasks to address DR 7 – Must have stage, phases or levels DR 8 – Aspects of Lean implementations DR 9 – Aspects of Lean DR 10 – Aspects of Ubuntu DR 11 – Aspects of change model DR 12 – Must not include any barriers to Lean implementation	1 - The framework is simple in design 2 – The framework is visually intuitive 3 – The framework is legible 4 – The framework outlines a philosophy 5 – The framework adopts change processes 6 – The framework has different tasks for different parties (people) 7 – The framework has stages and phases 8 – The framework contains aspects of Lean implementation 9 – The framework contains original aspects of Lean 10 – The framework contains aspects of Ubuntu 11 – The framework incorporates a change model 12 – The framework does not include any barriers to Lean implementation
Validate problem statement (PS)	PS - The research problem to be addressed, is the low Lean implementation success rate in South Africa due to a lack of culture-specific Lean implementation frameworks	13 – There is a low implementation success rate for Lean in South Africa 14 – Low implementation success rates may be due to a lack consideration of culture-specific lean implementation
Prove the artefact is valid (address the problem)	PS - The research problem to be addressed, is the low Lean implementation success rate in South Africa due to a lack of culture-specific Lean implementation frameworks	15 - The Lean-Ubuntu framework considers South African cultural aspects into Lean implementation 16 – The Lean-Ubuntu framework could increase the success rate of Lean implementation in South Africa

Verify applicability of the artefact	To check if this can be implemented in different organisations and industries	17 – This framework could be implemented in various organisations and industries
Verify novelty of the artefact	To test the originality and novelty of the proposed framework	18 - To the best of your knowledge would you say, the construction and integration of the Lean-Ubuntu framework is an original design (as opposed to just a duplication of other previous work)

8.4.5 Format (Layout) of the survey

The final survey format (available in appendix A) used a structure akin to that of Coetzee (2018) and was composed of the following sections:

- Introduction and informed consent
- Participant data
- The outline of the Lean-Ubuntu Implementation framework video (link)
- Confirmation of the design requirements
- Confirmation that the Lean-Ubuntu implementation framework addresses the research problem
- Closure

8.5 Survey analysis method

In order to analyse the survey results the following method was used:

- **Step 1** – The results were tabulated on an excel sheet
- **Step 2** – The quantitative and qualitative results were divided up, to be analysed separately
- **Step 3** – The Cronbach alpha statistic was calculated to test the reliability of the survey
- **Step 4** – For the quantitative results, the average for each statement was calculated.
- **Step 4.1** – If the average was above 75% (3.75) consensus was reached and the statement had been verified or validated.
- **Step 4.2** – In the case that consensus was not achieved for a statement, the qualitative results were analysed for that statement. This was done to understand why consensus was not achieved and to address any shortcomings that were mentioned in the qualitative feedback. The shortcomings were discussed (section 8.6) and addressed, resulting in the updated framework (presented in section 8.7).

8.6 Survey results

After the survey was conducted the results and feedback were tabulated and analysed (available in appendix B). An overview of the survey results are captured in table 11, showcasing the average obtained for each survey statement.

Table 11: Survey Results

Survey statement	Average	Percentage
1 - The framework is simple in design	4,17	83,3%
2 – The framework is visually intuitive	4,00	80,0%
3 – The framework is legible	3,56	71,1%
4 – The framework outlines a philosophy	4,33	86,7%
5 – The framework adopts change processes	3,94	78,9%
6 – The framework has different tasks for different parties (people)	4,28	85,6%
7 – The framework has stages and phases	3,89	77,8%
8 – The framework contains aspects of Lean implementation	4,33	86,7%
9 – The framework contains original aspects of Lean	4,11	82,2%
10 – The framework contains aspects of Ubuntu	4,22	84,4%
11 – The framework incorporates a change model	3,94	78,9%
12 – The framework does not include any barriers to Lean implementation	3,33	66,7%
13 – There is a low implementation success rate for Lean in South Africa	4,11	82,2%
14 – Low implementation success rates may be due to a lack consideration of culture-specific lean implementation	4,00	80,0%
15 - The Lean-Ubuntu framework considers South African cultural aspects into Lean implementation	3,89	77,8%
16 – The Lean-Ubuntu framework could increase the success rate of Lean implementation in South Africa	3,67	73,3%
17 – This framework could be implemented in various organisations and industries	3,61	72,2%
18 - To the best of your knowledge would you, the construction and integration of the Lean-Ubuntu framework is an original design (as opposed to just a duplication of other previous work)	3,94	78,9%

In order to test the reliability of the survey, Cronbach's alpha was calculated. This allowed for the measurement of internal consistency and reliability of the survey design. The calculation overview is showcased as follows; however, the detailed calculation can be seen in appendix C:

$$\alpha = \left(\frac{k}{k-1} \right) \left(\frac{s_y^2 - \sum s_i^2}{s_y^2} \right) = \left(\frac{18}{18-1} \right) \left(\frac{81.41 - 13.76}{81.41} \right) = 0.879$$

From the calculation, an α value of 0.879 was obtained. According to Cronbach's alpha, this statistic is within the good range of internal consistency, implying that the survey was reliably designed and answered with understanding from participants.

The results from table 11 are further discussed in section 8.5.1 to 8.5.5, based on the quantitative feedback (averages) and qualitative feedback (comments and notes), with the raw data available

in appendix B. The purpose of the survey was to verify and validate the framework. Survey participants were given a video explaining the framework itself and not the semantics behind the design process. When working through the qualitative results, it became apparent that some participants provided feedback outside the scope and purpose of the survey, for example: comments on the scientific accuracy of the design method used for the framework, or examined the inputs used to design the framework. These comments were not considered during the analysis, as they were outside of the scope of the survey (which was to evaluate the framework itself).

8.6.1 Verify design requirements of the framework

The design requirements for the framework were evaluated using survey statements 1 – 12. From the results in table 11, it can be seen that the majority of the statements received consensus from participants. However, statement 3 and 12 did not display consensus amongst participants, as the averages were below 3.75. For **statement 3**, the legibility of the framework was tested, resulting in an average of 71% agreement. Participants were given two options to watch the video explaining the framework (in consideration for data usage of participants), one option was a smaller file size, ergo reducing the quality of the video and legibility of the framework consequently. The lower ratings are attributed to participants selecting to watch the poor quality of the video in the survey. However, the original file for the framework is presented in higher quality, thus ensuring the legibility of the framework. Therefore, it can be determined that the design requirement for legibility (survey statement 3), has been achieved.

Additionally, **statement 12**, the framework does not include any barriers to Lean implementation, was rated 66.7% agreement, thus below the level of consensus. Once the feedback started to come in, it became evident that participants were misinterpreting the statement. However, in staying true to the scientific method, the statement was not changed for other participants. The low score can be attributed to the statement being phrased ambiguously, containing a double negative. This could have confused some participants. However, it can also be attributed to the use of “Lean terminology” in the framework, such as “JIT and Andon”. Participant 18 explained that this may confuse workers during Lean implementation. However, given that Lean-Ubuntu principle 1 focused on introducing workers to Lean concepts and that workers will attend various training session during implementation, consideration will be given to terminology. Workers will learn the various terms, and this will prevent a barrier. Participant 16 made the recommendation to consider unions in the framework, as unions play a huge part in the South African work culture. This valuable and important feedback was incorporated in the updated Lean-Ubuntu principle 4 was included in the update framework in section 8.6. This can allow organisations to get buy-in from unions so that employee buy-in is increased during the implementation. Ergo, it can be

determined that the design requirement for not including Lean barriers (survey statement 12) has been achieved.

8.6.2 Validate problem statement

Survey statements 13 and 14 were focused on validating the problem statement. The results indicated in table 11 showcase that both these statements proved consensus amongst participants, showing that the research problem is valid and occurs in industry. Participant 11 stated that:

“There definitely is a low implementation success rate for Lean in South Africa. The roots of the Philosophy are not South African and incorporating the South African perspective may surely help in improving the success rate”

This expresses that the low Lean implementation success rates in South Africa are definitely an issue and can be attributed to a disconnect in cultural roots. Ergo, the research problem was validated by participants.

8.6.3 Prove the artefact is valid (addressing the problem)

To prove the validity of the artefact in addressing the research problem, survey statements 15 and 16 were evaluated. For statement 15, there was consensus amongst participants that the framework considers South African cultural aspects in Lean implementation. However, **statement 16**, the framework could increase the success rate of Lean implementation in South Africa, resulted in a 73% agreement level amongst participants (slightly below consensus). Due to consensus not being achieved, the qualitative feedback was investigated to understand the lower ratings. Participant 9 attributed their low score for this statement due to a lack of practical aspects in the framework. However, the framework is in its first phase of development (design phase of eADR) and has not been implemented yet, thus, there is no practical aspects to include. However, this comment is valuable for future research after the implementation phase of the framework in an organisation. Therefore, it is justified to remove participant 9's data point for statement 15 and recalculate the average. Upon removal of this data point, the average was recalculated as 3.76 (75.5%) and thus consensus was reached, attesting to the validity of the artefact. Participant 2 explained that their low score was attributed to a lack of industry 4.0 mention in the framework. This was a valuable point made by participant 2 and the change was incorporated as an updated Lean-Ubuntu principle 11 was included in the update framework in section 8.6.

Aside from these 2 participants, the other participants believed strongly that the framework would address the research problem. Participant 6 explained that industry could benefit greatly from this framework:

“Very well thought out framework, being in Industry for a number of years now and experienced working for smaller local and larger international companies, ALL companies operating in South Africa and Africa as a whole would greatly benefit from this”

Moreover, participant 13 agreed explaining how the framework can act as a bridge in understanding Lean, stating:

“Quite a visual and interactive approach that even readers with limited knowledge on Lean and its management philosophies can follow”

Furthermore, participant 18, explained how the framework incorporated South African aspects to address the research problem:

“I think incorporating South African specific culture aspects, such as Ubuntu, is truly a good idea of contextualizing the lean philosophy to our country. It is clear that various aspects have been incorporated into the model (implementation aspects, change management aspects, lean, ubuntu etc.) and I believe this creates somewhat of a fail-proof model”

8.6.4 Verify applicability of the artefact

In order to evaluate the framework's ability to be implemented in different organisations, **statement 17** focused on validating the applicability of the framework. Based on the results in table 11, statement 17 achieved an average of 72%, which is slightly below the consensus level. Despite not achieving consensus, there was agreement from participants that the framework can be implemented in various process driven organisations, and statement 17 stated that the “framework could be implemented in various organisations and industries” as opposed to all organisations. However, participant 4 expressed their reason for a lower score due to the heavy focus on the manufacturing sector:

“I am not convinced that it is broadly applicable - very manufacturing focused”

Another participant (6) explained that the framework does not account for service-based industry. Both of these participants made valid points as the framework was not designed to take into account the service industry. However, future research should focus on addressing this, perhaps adapting this framework for the service industry. Thus, it can be argued that while this framework

is not designed for the service industry, it could be applied to various process driven organisations and industries

8.6.5 Verify novelty of the artefact

The last survey statement, statement 18, tested if the construction and integration of the Lean-Ubuntu framework was an original design. This statement had a 79% agreement level amongst participants. With participant 8 expressing that the framework is original and innovative as not much research is conducted on Lean-Ubuntu, stating:

“Not much research is conducted on Lean-Ubuntu (framework is original and innovative)”

Furthermore, participant 7 expressed that:

“The research is original and may resonate with people of South Africa”

8.7. Updated framework

Considering the feedback and discussion in section 8.6, an updated Lean-Ubuntu implementation framework was created. The updated framework aimed to address the key aspects of the feedback provided by participants with regards to discrepancies found in the original framework. This led to the redesign of Lean-Ubuntu principle 4 and 11. The updated Lean-Ubuntu framework is presented in figure 38.

Updated Lean-Ubuntu principle 4

In light of the feedback provided in section 8.6.1, principle 4 was updated to include consultations with unions. It is important for organisations to keep unions informed and have mutual understanding with them. Thus, allowing organisations to get buy-in from unions so that employee buy-in is increased during the implementation. Figure 36 showcases the updated principle 4.

	Business execution levels	Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
LUP 4 – Foster openness with your partners and suppliers, in order to respect and challenge them	Strategic (Upper management)	Create openness with your unions, partners and suppliers. Challenge your suppliers.	Communicate with each other. Share information . Set target for partners and suppliers. Keep unions informed	Develop suppliers. Have mutual understanding with unions and partners. Learn from each other.
	Tactical (Supervisors)			
	Operational (Floor workers)			

Figure 36: Updated Lean-Ubuntu principle 4

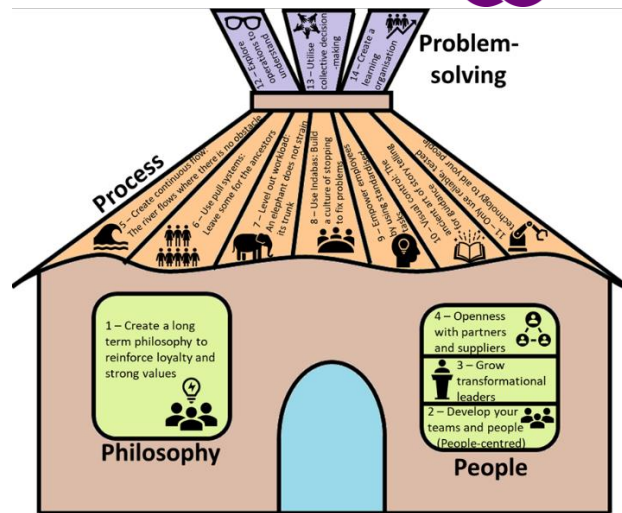
Updated Lean-Ubuntu principle 11

The commentary provided by participant 2 in section 8.6.3, suggested making a consideration for Industry 4.0 technologies. Principle 11 was updated to ensure that the implications of Industry 4.0 technologies are discussed and explained to employees prior to implementation, thus reducing the fear of new technology. Figure 37 showcases the updated principle 11.

	Business execution levels	Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
LUP 11 – Only use reliable, tested technology to aid your people	Strategic (Upper management)	Start a conversation about new technologies that may be introduced. Explain the implication of Industry 4.0 technology prior to implementation	Allow for training opportunities	Test technology before allowing others to use it. Manage support systems for new technology
	Tactical (Supervisors)	Create cross-functional teams	Attend training and understand the new technologies	Participate in pilot tests of technology. Explain your understanding with others
	Operational (Floor workers)	Join cross-functional teams	Attend training and understand the new technologies	Participate in pilot tests of technology. Explain your understanding with others

Figure 37: Updated Lean-Ubuntu principle 11

The Lean-Ubuntu Implementation framework



	Business execution levels	Change model phases		
		1. Creating a climate for change	2. Engagement and enabling the organisation	3. Implementing and sustaining the change
LUP 1 – Create a long term philosophy to reinforce loyalty and strong values	Strategic (Upper management)	Establish the company's purpose and vision based on current company culture and Lean culture.	Communicate the company's purpose and vision.	Host workshops and events for defining and exploring the company's purpose and vision. (Cultivate the culture)
	Tactical (Supervisors)		Recognise and acknowledge employee commitment to the culture	Promote a caring environment and live the company vision
	Operational (Floor workers)		Recognise and acknowledge other employee's commitment to the culture	Understand and promote the company vision and purpose
LUP 2 – Develop your teams and people for a people-centred work culture	Strategic (Upper management)	Motivate employees. Create opportunities for growth and development of your people	Share training opportunities with employees	Track performance and create promotion opportunities
	Tactical (Supervisors)	Form personal development teams with other employees	Attend and/or complete training opportunities	Teach new skills to other members of your team. Track performance
	Operational (Floor workers)	Form personal development teams with other employees	Attend and/or complete training opportunities	Teach new skills to other members of your team
LUP 3 – Grow transformational leaders, who understand the work and mentor other	Strategic (Upper management)	Recognise internal employees for leadership roles	Give employees the opportunity to take on leadership roles	Strengthen people-centredness
	Tactical (Supervisors)		Attend and/or complete training opportunities	Strengthen people-centredness. Support operations. Promote the system. Lead change. Inspire others
	Operational (Floor workers)		Attend and/or complete training opportunities	Support operations. Promote the system. Lead change. Inspire others
LUP 4 – Foster openness with your partners and suppliers, in order to respect and challenge them	Strategic (Upper management)	Create openness with your unions, partners and suppliers. Challenge your suppliers.	Communicate with each other. Share information. Set target for partners and suppliers. Keep unions informed	Develop suppliers. Have mutual understanding. Learn from each other.
	Tactical (Supervisors)			
	Operational (Floor workers)			
LUP 5 – Create continuous flow: The river flows where there is no obstacle	Strategic (Upper management)	Develop a single piece flow plan	Use visual control to promote and support the plan	Implement single piece flow and conduct Lean audits occasionally.
	Tactical (Supervisors)	Establish connected processes and takt times	Introduce Kanbans and redesign layouts to support the changes	Utilise kanbans and head problem solving teams. Monitor takt times and improvements
	Operational (Floor workers)	Join problem solving teams	Identify problems, get to know the new tools (kanbans etc)	Utilise single piece flow. Investigate problems
LUP 6 – Use pull systems: Leave some for the ancestors	Strategic (Upper management)	Define agreements with specific limits for product volume between suppliers and customers	Dedicate items that are shared between parties to them (resources, storage etc)	Implement visually apparent and physically constrained control methods.
	Tactical (Supervisors)			JIT System - Aim to remove kanbans overtime and link process steps with no inventory.
	Operational (Floor workers)		Understand Pull techniques and aim to achieve product limits	Work on reducing kanbans
LUP 7 – Level out the workload: An elephant does not strain its trunk	Strategic (Upper management)	Establish that levelling is an enterprise wide process	Explain and discuss wastes	Aim to reduce wastes
	Tactical (Supervisors)	Identify the most important items (with greatest benefits). Identify multiples for the level pattern	Display a schedule that dictates replenishment and sets a pitch based on current conditions	Implement new standards based on new schedules and takt times
	Operational (Floor workers)		Organise product volume, mix and sequence	Identify and reduce wastes. Work based on the schedule
LUP 8 – Use Indabas: Build a culture of stopping to fix problems	Strategic (Upper management)	Pay attention to the respect and dignity of the people	Define the roles and procedures for response to problems	Have designated people for response to line stops. Conduct timely quality audits
	Tactical (Supervisors)	Establish a practical degree of stability in processes	Make sure a method to stop the line is understood and accessible to all employees.	Make use of visual control, standardised work, jidoka and poke-yoke
	Operational (Floor workers)	Understand the process to stop the line. Know the exact points of the problem	Learn to solve problems and make it a need to fix issues	Conduct self-inspection and report problems. Fix issues at the source.
LUP 9 – Empower employees by using standardised tasks	Strategic (Upper management)	Create a structure to support standardised work. Establish that standardised tasks are the starting point for continuous improvement	Create documentation for standard work	Provide examples and training opportunities
	Tactical (Supervisors)	Establish defined expectations for different tasks	Install performance boards and andons	Create a repeatable work method. Install visual management indicators
	Operational (Floor workers)		Attend training and understand the requirements for "perfect products and tasks"	Follow stands for tasks and monitor performance
LUP 10 – Visual control: The ancient art of storytelling for guidance	Strategic (Upper management)	Understand the details needed for visual control and story telling	Role out 5s within the organisation while facilitating communication	Develop visuals and stories about standards
	Tactical (Supervisors)		Make standards visible and tell stories about them.	Teach 5s and monitor standards
	Operational (Floor workers)	Understand the standard and learn 5s	Investigate or inspect work to report deviations. Talk about standards with others	Implement 5s. Correct deviations.
LUP 11 – Only use reliable, tested technology to aid your people	Strategic (Upper management)	Start a conversation about new technologies that may be introduced. Explain industry 4.0 technology prior to implementation	Allow for training opportunities	Test technology before allowing others to use it. Manage support systems for new technology
	Tactical (Supervisors)	Create cross-functional teams	Attend training and understand the new technologies	Participate in pilot tests of technology. Explain your understanding with others
	Operational (Floor workers)	Join cross-functional teams	Attend training and understand the new technologies	Participate in pilot tests of technology. Explain your understanding with others
LUP 12 – Explore the operations to understand the problem	Strategic (Upper management)	Create cross-functional teams and rewards systems	Give opportunities for training cross-functional teams and kaizen management	Provide support for employees and regularly conduct Gemba walks
	Tactical (Supervisors)	Join a cross-functional team and attend training	Take the opportunity to explain work problems to others. Discuss possible solutions	Provide support for employees and regularly conduct Gemba walks
	Operational (Floor workers)	Join a cross-functional team and attend training	Take the opportunity to explain work problems to others. Discuss possible solutions	Conduct problem solving in cross-functional teams
LUP 13 – Utilise collective decision making	Strategic (Upper management)	Create opportunities for regular group meetings	Differentiate between short-term and long-term issues	Start small problem solving projects with employees
	Tactical (Supervisors)	Attend group meeting and highlight problems	Solve problems by utilising the PDCA cycle and 5-why analysis in problem solving teams	Display outcomes of projects with A3 reports and build consensus with us for group decisions
	Operational (Floor workers)	Attend group meeting and highlight problems	Solve problems by utilising the PDCA cycle and 5-why analysis in problem solving teams	Display outcomes of projects with A3 reports and build consensus with us for group decisions
LUP 14 – Create a learning organisation via reflection and continuous improvement	Strategic (Upper management)	Create the environment for participation, accountability, commitment and structure	Provide opportunities for participating in and communicating kaizen projects	Reflect on the improvements
	Tactical (Supervisors)	Be aware of areas for improvement. Learn to learn. Understand that improvements happen in small steps	Utilise Hoshan Kanri to design improvement plans.	Participating in and communicating kaizen projects
	Operational (Floor workers)	Be aware of areas for improvement. Learn to learn. Understand that improvements happen in small steps	Utilise Hoshan Kanri to design improvement plans	Participating in and communicating kaizen projects

Figure 38: The updated Lean-Ubuntu implementation framework

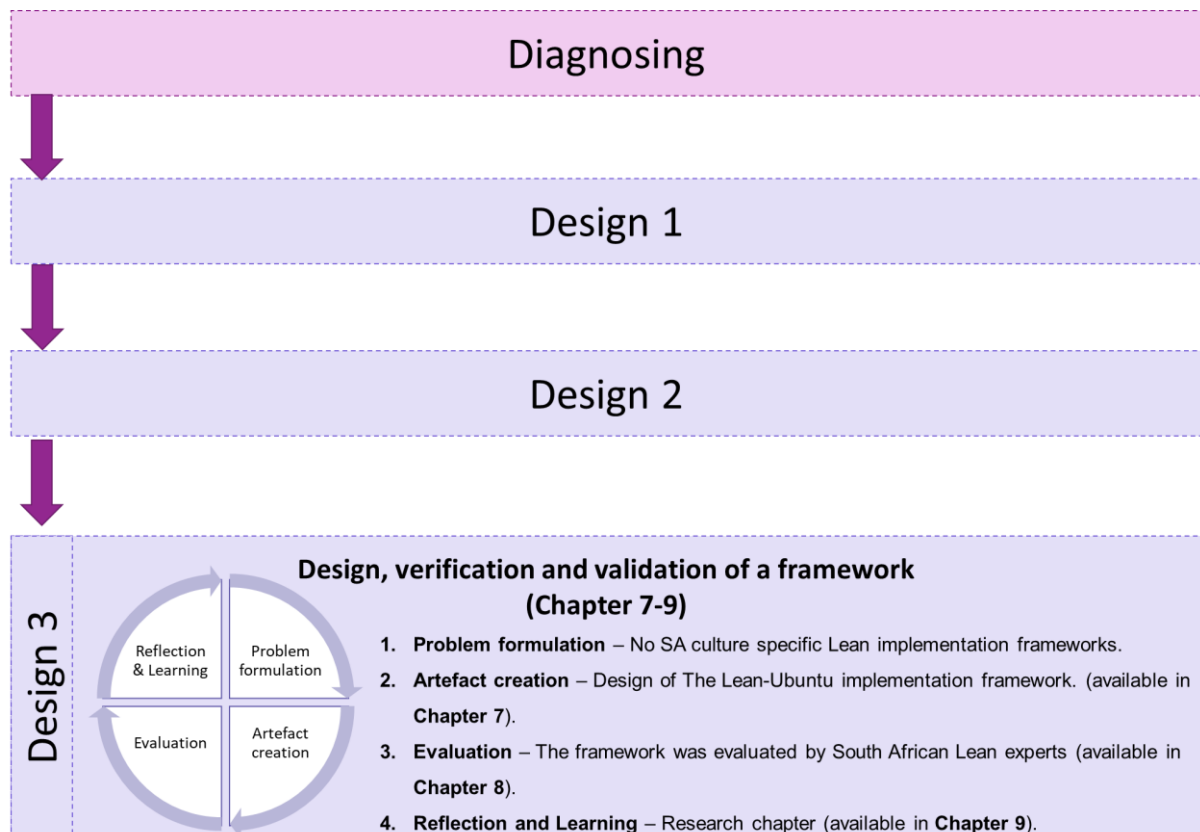
8.7 Chapter summary

This chapter explored the approach, construction and results from the survey. The qualitative and quantitative feedback was presented for statements, showcasing the verification and validation of the study. Based on the feedback, an updated Lean-Ubuntu implementation framework was created, redesigning principle 4 and 11.

CHAPTER 9

Verification and Validation

This chapter summarises the different strategies utilised for verification and validation throughout this research.



9.1 Introduction

The research study presented in this thesis was verified and validated using several different approaches. This chapter discusses and summarises these strategies. In the case of this study, verification was understood as confirming that conducted research or the designed artefact in the correct manner, by following a prescribed method (Arthur et al., 1999). On the other hand, validation was understood as confirming the artefact's ability to address or solve the issue or problem in industry (Arthur et al., 1999).

9.2 Verification

The verification process for the research study comprised of the following phases:

- **Design of survey** – The survey design requirements were based on literature and were verified by the researcher via a checklist (Chapter 8)
- **Design requirements for the Lean-Ubuntu implementation framework** – The design requirements adherence was verified by South African Lean experts via the survey (Chapter 8)
- **Applicability of the artefact** – South African Lean experts were surveyed to check if the framework could be implemented in different organisations and industries (Chapter 8)
- **Novelty of the artefact** – The originality and novelty of the framework was verified by South African Lean experts (Chapter 8)

9.2.1 Verification of survey design

Literature was used to guide the design of the survey, by means of a survey design requirement checklist. This checklist was discussed in section 8.4.1 and is reiterated in table 12. Table 12 was used by the researcher to verify that the survey adhered to the design requirements

Table 12: Verification of survey design requirements

Survey design requirement	Achieved
1. Format of the survey should be uncluttered and well spread	✓
2. Instructions should be included	✓
3. A thank you message should be included at the end of the survey	✓
4. One should make use of a pre-existing scale for responses	✓
5. Statements should not be vague or ambiguous	✓
6. Statements should not be leading or persuasive	✓
7. Statements should not contain unexplained jargon or acronyms	✓
8. Statements should be as few as possible	✓
9. Statements should be as short as possible	✓
10. Statements should not double-barrelled	✓
11. Grouping should be utilised for compartmentalising statements	✓
12. Surveys should maintain anonymity and confidentiality of the participants	✓
13. Statements should be composed in simple and basic English, & pitched at the right level	✓
14. Each statement should be relevant to the validation and verification process	✓

9.2.2 Verification of Design requirements for the Lean-Ubuntu implementation framework

The design requirements for the Lean-Ubuntu implementation framework were verified by South African Lean experts via a survey (as discussed in chapter 8). The survey made use of 12 design requirements to confirm that the framework met the requirements (available in table 13).

Table 13: Verification for the framework design requirements

Survey statement	Average	Percentage
1 - The framework is simple in design	4,17	83,3%
2 – The framework is visually intuitive	4,00	80,0%
3 – The framework is legible	3,56	71,1%
4 – The framework outlines a philosophy	4,33	86,7%
5 – The framework adopts change processes	3,94	78,9%
6 – The framework has different tasks for different parties (people)	4,28	85,6%
7 – The framework has stages and phases	3,89	77,8%
8 – The framework contains aspects of Lean implementation	4,33	86,7%
9 – The framework contains original aspects of Lean	4,11	82,2%
10 – The framework contains aspects of Ubuntu	4,22	84,4%
11 – The framework incorporates a change model	3,94	78,9%
12 – The framework does not include any barriers to Lean implementation	3,33	66,7%

As discussed in section 8.6.1, design requirements 3 and 12 were not initially scored over 3.75 (75%). However, this has since been achieved. After conducting the analysis and making the considerations in chapter 8, consensus was achieved.

9.2.3 Verification of Applicability of the artefact

The applicability of the Lean-Ubuntu implementation framework in various organisations or industries was verified by South African Lean experts via a survey (as discussed in chapter 8). The survey made use of a statement to confirm that the framework may be implemented in different companies and settings (available in table 14).

Table 14: Verification of applicability of framework

Survey statement	Average	Percentage
17 – This framework could be implemented in various organisations and industries	3,61	72,2%

As discussed in section 8.6.4, survey statement 17 was not initially scored over 3.75 (75%). However, this has since been corrected. After conducting the analysis and making the considerations in chapter 8, consensus was achieved.

9.2.4 Verification of the novelty of the artefact

The novelty of the Lean-Ubuntu implementation framework was verified by South African Lean experts via a survey (as discussed in chapter 8). The survey made use of a statement to confirm that the construction and integration of the Lean-Ubuntu implementation framework was an original design (as opposed to just a duplication of other previous work) (available in table 15).

Table 15: Verification of framework novelty

Survey statement	Average	Percentage
18 - To the best of your knowledge would you, the construction and integration of the Lean-Ubuntu framework is an original design (as opposed to just a duplication of other previous work)	3,94	78,9%

Since the average for the statement was above 75%, it can be declared that consensus was reached, thus verifying the novelty of the artefact.

9.3 Validation

The validation process consisted of the following phases:

- **Research problem** – An investigation was conducted to determine if a culture-specific, Lean implementation framework exists for the South African context (Chapter 4). Furthermore, the research problem was validated by South African Lean experts, via surveys (Chapter 8)
- **Research design** – The research design was validated by using the DSR guidelines, the ADR principles and a research validation matrix
- **Research Output** – Surveys were used to validate that the Lean-Ubuntu implementation framework could address the research problem (Chapter 8)

9.3.1 Validation of the research problem

As stated in chapter 1, the research problem is:

The research problem to be addressed, is the low Lean implementation success rate in South Africa due to a lack of culture-specific Lean implementation frameworks, adapted for the diverse culture of South Africa

This was validated in two ways: an investigation into existing frameworks and the survey.

9.3.1.1 Validation results from the investigation into existing frameworks

In chapter 4, a research paper investigated the existing Lean implementation frameworks in South Africa. This was achieved by conducting a systematic literature review, thus allowing for the examination of all existing South African Lean implementation frameworks.

Furthermore, the research paper illustrated the various South African Lean implementation frameworks and the various knowledge areas that they fall within. However, it was highlighted that there is no culture-specific Lean implementation framework adapted for the diverse culture of South Africa.

9.3.1.2 Validation results from survey

The research problem was also validated by South African Lean experts, via a survey (as captured in section 8.6.2. The survey validated both aspects of the problem statement (captured in table 16). The average for both statements was above 75%, thus it can be concluded that consensus was reached, thus validating the research problem.

Table 16: Validation of research problem

Survey statement	Average	Percentage
13 – There is a low implementation success rate for Lean in South Africa	4,11	82,2%
14 – Low implementation success rates may be due to a lack consideration of culture-specific lean implementation	4,00	80,0%

9.3.2 Validation of research design

The following three sections discuss the validity of the research design that was followed:

- DSR guidelines – section 9.3.2.1
- ADR principles – section 9.3.2.2
- Research validation matrix – section 9.3.2.3

9.3.2.1. DSR guidelines

Due to the fact that the research was set within the DSR paradigm, the DSR guidelines were utilised to validate the research method. The seven guidelines were achieved throughout the study and are illustrated in table 17.

Table 17: Validation of DSR guidelines

#	Guideline	Description	Validation	Available in
1	Design as an artefact	DSR must create a viable artefact in one of the forms (Construct, model, method or instantiation)	The research lead to the development of the Lean-Ubuntu implementation framework as an artefact.	Chapter 7
2	Problem relevance	The objective of DSR is to develop technology-based solutions to critical and appropriate business problems	The framework addresses the relevant industry problem of low Lean success rates and a lack of culture-specific Lean frameworks	Chapter 7
3	Design evaluation	The utility, quality and efficacy of the artefact must be meticulously displayed via well-executed assessment methods	Surveys were utilised to verify and validate the utility, quality and efficacy of the framework	Chapter 8
4	Research contributions	Effective DSR must give a clear and verifiable contribution in the areas the artefact, design foundations and/or design methodologies.	The contribution of the framework was confirmed via surveys. Moreover, other contributions were confirmed in published and submitted research papers.	Chapter 8
5	Research rigor	DSR relies on the use of rigorous methods during the construction and evaluation of the artefact	Scientific research methods were used throughout the study.	Chapter 4 – 8
6	Design as a search process	The quest for an effective artefact requires using the available mean to reach desired ends, whilst satisfying laws in the problem situation	SLRs was used to investigate existing frameworks and to collect data on frameworks. Interviews were conducted to collect data	Chapter 4 - 6
7	Communication of research	DSR must be presented effectively to technology-oriented and management-oriented audiences.	The research output (framework) was presented to audiences using a video. Moreover, the study was communicated in this thesis	Chapter 8 and Chapter 1 - 10

9.3.2.2 ADR principles

ADR prescribes seven principles for researchers, as a method for creating design knowledge by building and evaluating artefacts. Throughout this research these seven principles were achieved and are showcased in table 18.

Table 18: Validation ADR principles

#	Principle	Description	Validation	Available in
1	Practice-Inspired Research	Emphasis is placed on looking at industry or field problems as opportunities for knowledge-creation.	The SLR investigation, confirmed the occurrence of the industry problem of no culture-specific Lean implementation frameworks	Chapter 4
2	Theory-Ingrained Artefact	ADR artefacts are developed and evaluated based on theory	The interviews allowed for investigation of the management principles of Lean and Ubuntu. This	Chapter 5 and 7

			allowed for the artefact to be created using the existing knowledge.	
3	Reciprocal Shaping	The two domains (artefact and organisation setting) should be virtually inseparable.	The surveys allowed for the feedback of Lean experts, who work with Lean on a daily basis in industry	Chapter 8
4	Mutually Influential Roles	It is imperative that symbiotic learning occurs amongst the various project participants, by sharing knowledge with each other.	The surveys allowed for the feedback of Lean experts, who work with Lean on a daily basis in industry	Chapter 8
5	Authentic and Concurrent Evaluation	Evaluation should be inherent the building stage, as opposed to being conducted separately.	The building stage was outside the scope of this study; however, evaluation was conducted using surveys.	Chapter 8
6	Guided Emergence	The collective artefact should reflect the initial design by the researchers and its continuous sculpting from organisational use, perspectives and participants	The surveys allowed for the feedback of Lean experts, who work with Lean on a daily basis in industry	Chapter 8
7	Generalised outcomes	By including the organisational changes that occurred during implementation, one is able to generalise outcomes. Ergo, one should “move from the specific-and-unique to the generic-and-abstract.”	The outcomes, conclusions and recommendation for future research is captured in chapter 10	Chapter 10

9.3.2.3 Research validation matrix

An overview research method was used to cross-validate if the research adhered to a rigorous research design. The concept of this validation matrix draws inspiration from Coetzee (2018) and is adapted from Mangaroo-Pillay (2020). Coetzee (2018) explained that the real value of a research matrix lies in the ability to validate that each research challenge does address a research objective, while demonstrating which research design steps are applied to attain this.

Figure 39 depicts the research validation matrix used to validate the research method. There is a direct correlation between the matrix and the research design covered in chapter 3. The top row and left most column act as a legend to number the rows and columns for explanation purposes.

Row	Column	1	2	3	4
1		Problem statement: The research problem to be addressed, is the low Lean implementation success rate in South Africa due to a lack of culture specific Lean implementation frameworks, adapted for the diverse culture of South Africa			
2	eADR stages	Diagnosing	Design 1	Design 2	Design 3
3	Problem formulation (Main problem segment)	Lack of culture specific frameworks	No correlating Ubuntu principles for the 5 Lean principles	Requirements for Lean frameworks are unknown	No SA culture specific Lean implementation frameworks
4	Method	Systematic literature review (SLR)	Interviews	Systematic literature review (SLR)	Design requirements and surveys
5		Aim: To develop a culture specific Lean implementation framework for South Africa, utilising the Ubuntu management philosophy.			
6	Research solutions (Artefacts created)	List of existing SA Lean implementation frameworks (Proving no culture specific Lean framework)	Identification and naming of 5 new Ubuntu management principles.	House of guidance for designing a Lean framework	The Lean-Ubuntu implementation framework
7	Evaluation techniques	SLR protocol verified by a fellow researcher	Triangulation of interview transcripts, fieldnotes and personal reflections	SLR protocol verified by a fellow researcher	Surveying of Lean South African experts
8		Research Output: A verified and validated Lean-Ubuntu implementation framework			

Figure 39: Research validation matrix

In figure 39, **row 1** gives the overarching research problem, as stated in chapter 1. **Row 2** of the matrix provides the eADR stages. **Rows 3 and 4** give the problem formulation of each stage and the method followed respectively. The overarching research aim and output of this thesis is given in **rows 5 and 8** respectively. The artefact generated for each eADR stage is discussed in **row 6**, whereas **row 7** shows the evaluation techniques utilised.

By breaking down the overarching problem statement (row 1) into various sub-problem statements (row 3), the study was able to develop research solutions or artefacts (row 6) to each sub-problem. When put together, the artefacts allowed for the development of the overall research output (row 8).

The aforementioned discussion and matrix (figure 39) has proven that the research design followed a rigorous method, as each formulated problem was addressed with a specific research artefact (solution). Furthermore, when all the solutions in row 6 are considered, the research output is verified and validated.

9.3.3. Validation of research output

The research output was also validated by South African Lean experts, via a survey (as captured in section 8.6.3. The survey validated two aspects of the artefact (captured in table 19).

Table 19: Survey Results

Survey statement	Average	Percentage
15 - The Lean-Ubuntu framework considers South African cultural aspects in Lean implementation	3,89	77,8%
16 – The Lean-Ubuntu framework could increase the success rate of Lean implementation in South Africa	3,67	73,3%

The average for statement 15 was above 75%, thus validating that the designed framework considers the South African cultural aspects in Lean implementation. However, the average of statement 16 was originally not about 75%. Participant 9 attributed their low score for this statement due to a lack in practical aspects in the framework. However, the framework is in its first round of development and has not been implemented yet, thus, there is no practical aspects to include yet. Therefore, it is justified to remove participant 9's data point for statement 15 and recalculate the average. Upon removal of this data point, the average was recalculated as 3.76 (75.5%) and thus consensus was reached.

9.4 Chapter summary

This chapter confirmed that the problem statement, research method and the Lean-Ubuntu implementation framework was verified and validated using different techniques.

CHAPTER 10

Conclusions

This chapter concludes the research done by providing a summary and by discussing the contribution of the study, the limitations and recommendation for future studies.

10.1 Introduction

This chapter provides an overview of the research conducted and sets the way forward for future research by covering the limitations and recommendations of this research.

10.2 Research overview

Although Lean philosophy has become a global phenomenon, around 90% of Lean implementations fail, due to a multitude of reasons. As researchers have begun to investigate the barriers of Lean implementation, they have found that culture plays an important role in the success or failure of Lean implementation. Thus, it has been recommended that more investigations and research be done on Lean cultural adaptations in different countries. Previous studies explored the relationship between Lean management philosophy and Ubuntu management philosophy. It was found that these philosophies share various correlations and have variations between them.

Therefore, this thesis focused on the problem of a low Lean implementation success rate in South Africa, due to a lack of culture-specific Lean implementation frameworks. In order to address this problem, the aim of this study is to develop a culture-specific Lean implementation framework for South Africa, utilising the Ubuntu management philosophy.

The research followed the elaborated action design research (eADR) methodology, utilising the problem diagnosing, concept design and build stages. A systematic literature review was conducted, during the problem diagnosing stage, in order to explore existing South African Lean implementation frameworks and investigate culture-specific frameworks. However, it was found that no culture-specific Lean implementation frameworks exist in South Africa.

For the concept design stage 1, interviews were conducted with Ubuntu experts to explore established Ubuntu common practices and derive from them Ubuntu management principles that would correlate with the Lean principles that did not have correlating Ubuntu principles. This resulted in the naming of five Ubuntu principles that correspond to the process themed Lean principles.

During concept design stage 2, another systematic literature review was done. This allowed for the exploration and analysis of available Lean frameworks, in order to determine common design methods and elements amongst them. This led to the development of the “House of guidance for designing a Lean framework”, which included the following: 1) guidelines to the applicable literature to consider, 2) design element to include, 3) design methods to consider and 4) methods to test a Lean framework with.

The last design stage of this study guided the design and development of “the Lean-Ubuntu implementation framework”. This framework was designed by utilising the “House of guidance for designing a Lean framework” and incorporated the matching Lean and Ubuntu principles. The framework offers a guideline for practical implementation of Lean in a South African organisation. It considers the actions that must be taken on the three levels of business execution (Strategic, tactical and organisational) and guides them in three stages of change.

Considering the research scope (as mentioned in section 1.4) , the research followed the eADR methodology and focused on the diagnosing and design stages. Due to this, the Lean-Ubuntu implementation framework is still in its infancy (first round of design) and needed to be tested conceptually, as implementation was outside the scope of the study. Thus, the Lean-Ubuntu implementation framework was verified and validated via surveys with South African Lean experts.

10.3 Contribution

The DSR knowledge contribution framework (Gregor and Hevner, 2013) was used to orient the research contribution. From figure 40, the research can be placed in two quadrants, namely **improvement** and **exaptation**. This is due to the fact that this research resulted in a new solution (*The Lean-Ubuntu implementation framework*) to a known problem (*Low Lean implementation success rate in South Africa*) by incorporating existing solutions (*Cultural adaptations and Ubuntu management philosophy*) from other fields.

The improvement quadrant aims to create improved solutions, thus more efficient and effective products, processes, services, technologies and ideas (Gregor and Hevner, 2013). Whereas, the exaptation quadrant is focused on adapting and exapted effective, existing artefacts from other fields for related problems (Gregor and Hevner, 2013).

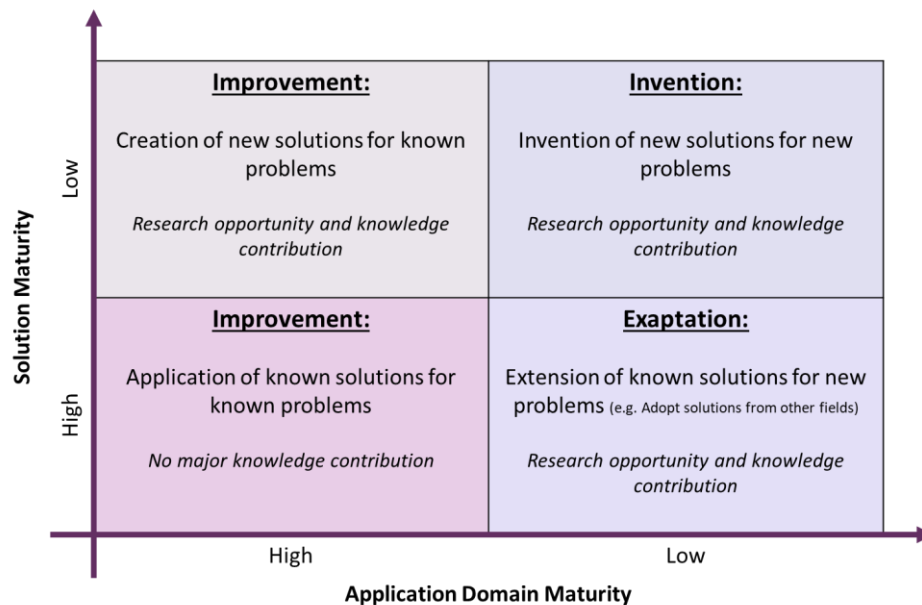


Figure 40: DSR knowledge contribution framework (Adapted from Gregor and Hevner (2013))

10.4 Limitations and recommendations for future research

The Lean-Ubuntu implementation framework could act as a bridge for South African organisations striving to implement Lean, thereby aiding them in understanding the Lean principles better and possibly contributing to a more successful Lean implementation.

In the diagnosing phase (chapter 4), an SLR was conducted to explore existing Lean frameworks. During this SLR it became apparent that university repositories were rich data sources for literature during an SLR. While this SLR investigated Lean implementation frameworks in South Africa, it is recommended that future studies explore frameworks on an international level, allowing for the categorisation of international research in the field. Furthermore, future research should also examine Lean implementation models and roadmaps (as opposed to only frameworks). Publications found within this SLR demonstrated the diversity and range of Lean application in numerous knowledge areas within South Africa. However, Lean implementation frameworks are not limited to these knowledge areas and future research should build on also developing frameworks in other knowledge areas such as Lean and Green, Lean leadership or Lean accounting.

In the design phase 1 (chapter 5), interviews were conducted with Ubuntu experts to investigate corresponding Ubuntu principles for the unmatched Lean principles. It was found that various examples and stories about Ubuntu all shared the common thread of understanding and humanness, which are key values of Ubuntu. While this study focused on South African Ubuntu, it is recommended that future research explore other African countries' interpretations of Ubuntu.

In the design phase 2 (chapter 6), another SLR was conducted to investigate the aspects of Lean frameworks, in order to determine common design requirements and testing methods. This SLR study investigated the methods and design elements of Lean frameworks. However, it is recommended that future research be done on the method and design elements of Lean models as well. While this SLR only focuses on Lean frameworks, it is therefore suggested that future studies investigate frameworks in general, which may allow for a fulsome overview and comparison of frameworks over various fields of study. This study concentrated on investigating studies that created Lean frameworks, ergo it is advised that future research explore the implementation strategies and outcomes of Lean frameworks

In the design phase 3 (chapter 7), the Lean-Ubuntu implementation framework was designed. This framework was very process driven, therefore, future research should explore adapting this framework to a service sector context. Moreover, this study focused on the design of the framework, while future studies should explore the implementation of it.

The Lean-Ubuntu implementation framework was evaluated by a panel of 18 South African Lean experts, while this was a sufficient sample size, it is suggested that a bigger sample be utilised in future for more detailed and diverse feedback.

While the Lean-Ubuntu implementation framework is presented in English, it is recommended that future studies work on translating the framework into all official South African languages to increase employee understanding. Although this study explored Ubuntu principles that correlated with Lean principles, it is recommended that future studies explore the possibilities of finding South African concepts or terms for the different Lean terms and concepts, like Andon and Jidoka.

10.5 Concluding remarks

The research in this thesis aimed to address the low Lean success rate in South Africa due to a lack of culture-specific Lean implementation frameworks. South Africa is a melting pot of diversity, but humanness, Ubuntu, is intrinsically South African. Whether South Africans practice it by name, or unintentionally, it is a part of everyone because “I am a person through other people”. By creating a South African culture-specific Lean implementation framework, one is able to convey foreign concepts to local employees, thereby increasing the employee understanding and buy-in to increase the success rate of Lean implementation.

When people understand the value and contribution of Lean, they are more likely to embrace to their organisation becoming Lean; because Lean is not just a toolbox, it is a cultural transformation.

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APPENDIX A

Survey Questions

The Lean-Ubuntu framework Evaluation

Thank you so much for your time and willingness to participate in this study.

This study forms part of an Engineering PhD thesis: A Lean implementation framework encompassing South African Ubuntu (Ethics reference number: NWU-00105-20-A1)

The purpose of this survey is to verify and validate the framework (The Lean-Ubuntu implementation framework) as part of the aforementioned study.

Please note the following:

You may ask the researcher any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you might be involved. Also, your participation is entirely voluntary. If you decide not to participate, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point.

By continuing with the survey, you agree to take part in the research study titled: A South African Ubuntu analogy of Lean philosophy. You declare that:

- You have read the information above
- You clearly understand the research
- You have asked questions to the researcher and all your questions have been answered.
- You understand that taking part in this study is voluntary
- You may choose to leave the study at any time and will not be handled in a negative way if you do so.
- You may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if you do not follow the study plan, as agreed to.

* Required

Participant information

Please provide the following details, which is for record-keeping purposes only. Please note that your biographical data will be kept confidential and will not be shared.

1. a. Title, name and surname *

2. b. Email address *

3. c. How many years of experience do you have on Lean? (Please select one) *

Mark only one oval.

- ☐ 0-3 years
- ☐ 4-6 years
- ☐ 7-10 years
- ☐ 11-15 years
- ☐ 21 years and more

The outline of the Lean-Ubuntu Implementation framework video

In order to answer the following questions, kindly access this video at https://drive.google.com/file/d/1qkZVhTdf_A-Sl1FbRvWpj9xsuizVd9Z/view?usp=sharing (or https://drive.google.com/file/d/1-mr5ruLN16lrfgLmwnS_0U27zrNG41n4/view?usp=sharing for a smaller file)

Confirmation of the design requirements

Please rate your level of agreement to each of the following statements, regarding the design and appearance of the Lean-Ubuntu implementation framework

4. Design requirements *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1 - The framework is simple in design	☐	☐	☐	☐	☐
2 - The framework is visually intuitive	☐	☐	☐	☐	☐
3 - The framework is legible	☐	☐	☐	☐	☐
4 - The framework outlines a philosophy	☐	☐	☐	☐	☐
5 - The framework adopts change processes	☐	☐	☐	☐	☐
6 - The framework has different tasks for different parties (people)	☐	☐	☐	☐	☐
7 - The framework has stages and phases	☐	☐	☐	☐	☐
8 - The framework	☐	☐	☐	☐	☐

contains
aspects of
Lean
implementation

9 – The
framework
contains
original
aspects of
Lean

☐☐☐☐☐

10 – The
framework
contains
aspects of
Ubuntu

☐☐☐☐☐

11 – The
framework
incorporates a
change model

☐☐☐☐☐

12 – The
framework
does not
include any
barriers to
Lean
implementation

☐☐☐☐☐

5. Please provide comments (Optional)

Confirmation that the Lean-Ubuntu implementation framework addresses the research problem

Please rate your level of agreement to each of the following statements, regarding the ability of the Lean-Ubuntu implementation framework to address the research problem

6. Research problem and framework *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
13 – There is a low implementation success rate for Lean in South Africa	☐	☐	☐	☐	☐
14 – Low implementation success rates may be due to a lack consideration of culture specific lean implementation	☐	☐	☐	☐	☐
15 - The Lean-Ubuntu framework considers South African cultural aspects into Lean implementation	☐	☐	☐	☐	☐
16 – The Lean-Ubuntu framework could increase the success rate of Lean implementation in South Africa	☐	☐	☐	☐	☐
17 – This framework could be	☐	☐	☐	☐	☐

implemented in
various
organisations
and industries

18 - To the best
of your
knowledge
would you say,
the
construction
and integration
of the Lean-
Ubuntu
framework is
an original
design (as
opposed to just
a duplication of
other previous
work)

☐☐☐☐☐

7. Please provide comments (Optional)

Closure

Thank you very much, once again, for your time and effort in completing this survey. I really appreciate your valuable input into my research.

8. i. Would you be available for follow-up questions relating to this survey *

Mark only one oval.

- ☐ Yes
☐ No
☐ Maybe

9. ii. Would you like to receive an electronic copy of this research *

Mark only one oval.

- ☐ Yes
☐ No
☐ Maybe

10. ii. Any comments or remarks

This content is neither created nor endorsed by Google.

Google Forms

APPENDIX B

Participants' feedback on survey

Survey statements	Participants																		Original		Post Analysis	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	Average	Percentage	Average	Percentage
Level of experience	11-15 y	0-3 y	21 y+	11-15 y	0-3 y	7-10 y	7-10 y	4-6 y	11-15 y	21 y+	7-10 y	0-3 y	21 y+	4-6 y	4-6 y	4-6 y	4-6 y	4-6 y	4,17	83,3%	4,17	83,3%
1 - The framework is simple in design	4	5	2	4	4	4	4	5	4	2	5	5	5	5	4	4	4	4	4,00	80,0%	4,00	80,0%
2 - The framework is visually intuitive	3	5	2	4	4	5	5	5	4	2	5	4	5	2	4	4	4	4	3,56	71,1%	3,56	71,1%
3 - The framework is legible	1	4	3	2	4	5	4	4	4	2	4	4	5	2	4	4	4	4	4,33	86,7%	4,33	86,7%
4 - The framework outlines a philosophy	4	5	4	4	5	4	5	4	4	4	4	4	5	5	4	4	4	4	3,94	78,9%	3,94	78,9%
5 - The framework adopts change processes	4	5	4	4	5	4	3	4	4	2	4	4	5	4	4	4	3	4				
6 - The framework has different tasks for different parties (people)	4	5	4	4	4	4	5	4	4	4	5	3	5	4	4	4	5	5	4,28	85,6%	4,28	85,6%
7 - The framework has stages and phases	1	5	4	4	4	4	2	4	4	1	5	4	5	5	4	4	5	5	3,89	77,8%	3,89	77,8%
8 - The framework contains aspects of Lean implementation	4	5	4	4	4	4	4	4	4	4	5	5	5	5	4	4	4	4	4,33	86,7%	4,33	86,7%
9 - The framework contains original aspects of Lean	1	4	4	4	4	4	5	4	4	3	5	4	5	4	4	5	5	5	4,11	82,2%	4,11	82,2%
10 - The framework contains aspects of Ubuntu	4	4	4	4	5	4	4	5	4	4	5	4	4	5	4	4	3	5	4,22	84,4%	4,22	84,4%
11 - The framework incorporates a change model	4	5	3	3	4	4	4	4	4	2	5	4	5	4	3	4	4	4	3,94	78,9%	3,94	78,9%
12 - The framework does not include any barriers to Lean implementation	3	4	2	4	4	4	4	3	4	4	3	3	2	2	3	4	3	4	3,33	66,7%	3,33	66,7%
13 - There is a low implementation success rate for Lean in South Africa	2	4	4	2	4	5	4	5	5	4	5	4	4	5	4	4	5	4	4,11	82,2%	4,11	82,2%
14 - Low implementation success rates may be due to a lack consideration of culture specific lean implementation	3	5	4	4	4	5	4	4	5	3	4	4	5	4	2	4	4	4	4,00	80,0%	4,00	80,0%
15 - The Lean-Ubuntu framework considers South African cultural aspects into Lean implementation	3	4	4	4	4	5	4	5	4	3	5	4	3	5	3	2	3	5	3,89	77,8%	3,89	77,8%
16 - The Lean-Ubuntu framework could increase the success rate of Lean implementation in South Africa	3	5	3	4	4	5	3	4	2	3	4	4	5	4	3	2	3	5	3,67	73,3%	3,76	75,3%
17 - This framework could be implemented in various organisations and industries	4	5	3	2	4	3	5	4	3	2	4	3	5	4	3	4	3	4	3,61	72,2%	3,61	72,2%
18 - To the best of your knowledge would you, the construction and integration of the Lean-Ubuntu framework is an original design (as opposed to just a duplication of other previous work)	5	5	4	4	4	4	5	5	2	4	4	5	4	4	2	2	3	5			3,94	78,9%

Qualitative feedback			
#	Based on design requirements	Based on framework working	Overall feedback
1	For me the strong message that it's worthy of emphasis is that the substance of your work is the integration of your disciplines. Lean it's clearly the foundation add Ubuntu a flavour of a lens. Nothing wrong with that.	Any claims of the potential for success would be speculative, and quite frankly, unnecessary. This is very novel, conceptual, innovative work that considerably contributes to knowledge	This is very interesting work. I believe an important element you must not diminish is the primacy that your (cool) ubuntu lean house places in the philosophy. Explore that and particularly in relation to your claim of high failures of implementations In fact we need to talk about the idea of lean implementation as a thing. I guess because I'm light on ubuntu I don't see it jumping out at me as strongly as the lean stuff that's very obvious What I like is how you bring together two very human philosophies, it feels like they should fit together, I just wonder to what extent. you're mainly finding a vignette (e.g. Elephant doesn't strain it's trunk) as a way to explain lean, rather than to modify lean. Ponder this. Don't worry, you don't have to get this right, you own this whole concept, so a line in the sand is great.
2			A thought-through all encompassing thesis that's high applicable to the change management required in the current Manufacturing industry of South Africa. The 14 lean principles are highly adapted and relevant to the current South African scenario. Very much involving and relatable. However, scanning the horizons, the generalization in the presented framework and a rather limited consideration on an ever growing heavy-handedness of the prevailing disruptive technological dynamics may have this framework perceived as slightly difficult to implement in particular industries whose strategic focus is ever more

			transfixed on a "human-less autonomous robotic alternatives". These imminent transformations in industry may be thought of as having limited flexibility to accommodate a majority of these 14 principles. My opinion is to say, is there a requirement for a third eye foresight in the face of the fourth industrial revolution? Will lean concepts thrive with much groundbreaking success as in the past? Quality and performance is being designed into the equipment, and capabilities will be somehow fixed, and any attempt at kaizen approaches to improving them will involve major Capital expenditure, a whole shareholder commitment headache. So how flexible will industry be for the Ubuntu-Lean tools to succeed? All waste levels will require redesign of equipment? If possible, referencing specific case studies may be considered to close-quote the applicability, considering how today's industry is caught up in the tides of the fourth industrial revolution. A revolution that seeks to not only simplify operations but automate and eventually eliminate the human factor who is responsible for the MUDAS. Otherwise a great intellectual philosophical thesis. Very much relevant in the short to medium term strategies for target stakeholders. How we should predict what the future South African industry will be is possibly another philosophical realm. A great thought-provoking piece.
3	I appreciate the hard work to develop the frame work - well done. I am not sure the flipping of people and processes in the development process is sustainable - to for instance define teams and aspects such as that before	As said - good original work! However I am not sure the framework itself will improve success of lean implementation. The stronger emphasis on people aspects will definitely help - not sure the frame work will.	Dear Mia - hard work and starting to make some good link! But please read my two remarks above as well. I also strongly believe that a more people orientated approach supports lean a lot - and aspects of ubuntu can be applied with success. I do however believe

	processes is a potential trap for the whole process.		you are bending too far to try to accommodate(force?) ubuntu concepts into a lean application. The real application world is much harder than what people think, and a whole implementation project can stall if one cannot deliver tangible results - or delivering them too slow. But that is a whole separate discussion.
4	I have some specific comments on each LUP which I can share with you but a few general comments: Because I had no visibility of how the detail (for the three levels and three stages) were developed, I sometimes felt that the points were a little arbitrary. I would have liked more transparency of how these were selected so that I could "trust" the data in these blocks. The detail in the blocks is very manufacturing focused. I am not sure that the detail that is included could be used to implement Lean in a service organization for example. To the extent that I feel that it needs to be made explicitly clear that the framework is for manufacturing or the very specific manufacturing detail needs to be changed or expanded to make the framework more universally applicable in any context. There seems to be a mismatch in places between very vague statements in the detail blocks and then very specific, detailed statements that even refer to tools. So sometimes I found myself thinking that this is very explicitly stating exactly what to do and at other times the statement was quite vague leaving me wondering how that could be done in practice. When reading the vague comments - I felt that perhaps an "implementation framework" is the wrong word for what has been designed because I don't believe someone could "implement"	I really like the concept of this framework. I like the Ubuntu house. I really like the Ubuntu oriented principle descriptions and I hope that the thinking behind these is unpacked in detail in the thesis because I believe that this is where the real value in your research lies. I am a little less convinced by the detail in the blocks. Three key things: + I am not convinced that it is broadly applicable - very manufacturing focused. + The discrepancy between level of detail in blocks from very vague to super detailed makes it difficult to understand and use. + I am not convinced that this should be an implementation framework. I think it deviates from the purpose and problem that you are trying to solve. I think that it is in the wording and how you present the framework in your thesis but I would recommend focusing on "creating a bridge" between what is already well understood and documented - Lean and the South African culture. Where you have focused on these aspects, the light really shines and I can see so much value in what you have done - well done!	

Lean using this. I still really wonder if implementation framework is the correct word. I am not sure that this is what your framework actually does and as a result it actually detracts from the actual value that your framework is presenting. I would consider focusing on drawing the parallels to Ubuntu - and leave the implementation bit up to the experts (The Toyota way) - so it is a comparison or an adaptation. Your blocks are showing how it can be adapted and not necessarily how it can be implemented. I think this would also help with the vague vs detailed conundrum. Sometimes I felt that there was a mismatch between strategic and operational but only for a few LUPs. I could give the detail but I would expect that all tactical and operational activities would need to be supported and sometimes there is a disconnect between these levels. I feel quite strongly that LUP 2 focuses too much on training. What else is there? And here I would really have liked insight into how you decided what to put in the blocks. What about how disciplinary action is handled. In my experience, this is one of the greatest barriers to Lean implementation in South Africa and I don't see anything on how this should shift as part of the change plan. What about levels of decision making - another challenge in SA? LUP3 is also very training focused - what about providing appropriate and developmental operational experience? LUP4: I found myself asking HOW a lot for this one? Suggesting a prominence of the vague over the detailed. LUP6: There is more to continuous flow than single piece flow. Here I specifically found myself asking about		
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	other contexts, other than manufacturing. If I was using your framework to "implement" would this be able to help me? I was not convinced about this one. LUP6: At the strategic level this talks about customers and suppliers but what was lacking at the strategic level was the organisation itself I wondered about the choice of the three management levels? How were these chosen? Why is there no middle management? LUP 7 : Not only about waste although this was somewhat captured at the lower levels, but there was a disconnect between the focus on waste at a strategic level and scheduling only featuring at lower levels. LUP8: I am not sure that audits is a strategic function. I would also argue that this principle needs to be more than about "stopping a line" - needs to be about a culture of fixing problems (in hindsight perhaps captured better in later LUPs) But again, the culture of reporting problems in SA is often linked to disciplinary action and as a result, is often where things go wrong. I would expect this to be tackled somewhere in a SA oriented framework. LUP 9 had quite a few spelling and grammar mistakes - just check LUP 11: Also the selection of new technology LUP13: This is a LUP that is very very detailed - giving tools and specific approaches. This is contrast to the other LUPs which were much broader. There needs to be a level of consistency. LUP 1 for example said: develop a purpose and vision but gave no guidelines on how this would actually be done. And then, can this be for implementation.		
5			

6	More focus and attention could be placed on the barriers to lean implementation but also an overview of what lean implementation is like in a service based industry, i did a lot of research on this during my honours and the fact that typical Toyota way lean topics like JIT, KANBAN, POKE YOKE etc are all equally applicable to the service based industry but need to be packaged and executed slightly different, 5S for example in a service based industry would look at keeping office space and electronic folders clean etc. so perhaps some thought around making it easier to apply in a service based environment would be nice, but excellent thoughts, brilliant idea around the Ubuntu Lean house. You adopt the change processes nicely in the framework my only comment here is to think about the how to avoid, deal with and work around resistance to change aspect that likely every organisation will face	Perhaps more details could be given to the sustainability part of the framework, I have seen lean implementations fail, example: a consultant comes in for 6 months to 1 year, management tries to accelerate lean and then it falls flat when the consultant walks away because no one really bought into it or believes in it, if the company is making money no one cares about lean and if they aren't making money or much profit like many SA companies nowadays, then they think Lean is a quick fix way to cost save, reduced heads and get more output out in an unsustainable way. More around the roles and responsibilities that management plays in sustaining lean as well as the rest of the organisation Perhaps also more thought around Hoshin Kanri, strategy in the framework, one other aspect for implementation here is to conduct employee surveys to gauge their level of connection to the strategy and then gather more feedback as more implementation happens to check effectiveness	Very well thought out framework, being in Industry for a number of years now and experienced working for smaller local and larger international companies, ALL companies operating in South Africa and Africa as a whole would greatly benefit from this, sadly as we have leaders that are Baby boomers and Gen X leading most companies, they are often very difficult to convince to try and change their culture through lean tools, they also in my experience believe that Lean implementation can happen overnight or often confuse lean , they do this at the detriment of staff morale, productivity, customers etc. I would really be interested to see the rest of your research and it would be nice if 1 or 2 companies could pilot this framework, certainly this would be very helpful for a startup culture company, just finding its feet, its an excellent start point to build the ideal culture up front, companies with over 100 years in business will likely take very long to make this change and the more important part is how do we make the change sustainable.
7			The research is original and may resonate with people of South Africa. i liked the lean ubuntu house. is there a way of representing the terms like Kanban, Jidoka, Andons Hoshan Kanri in with South African equivalent? (Just knit picking). On LUP 13, is it possible to have on tactical techniques like PDCA Cycle, fish bone, DMAIC methodologies and have the 5why as the Tactical? is it possible to have the following Strategic (Senior Management / Middle Management), Tactical (Middle and Junior Manager) Situational Junior Managers/ Supervisors or Team leaders and Operators. The reason why

			am proposing this is that evry job has all three situational, Tactical and Strategic in various degrees. for example a Supervisor may spent 60% of his time on Situational issues like resolve breakdowns, 30% on tactical issues like what systems do we need to put in place to prevent repeat breakdowns and 10% on strategic issues like do we have to substitute material to improve the quality yeild? from LUP 11 - 14 the change models for situational and tactical are the same, can we try and differentiate it a bit?
8	The notion that people need to be factored in first before process improvement - provide a valuable insight	Not much research is conducted on Lean-Ubuntu (framework is original and innovative).	Focus on people-centeredness is vital as outlined in presentation
9	I think there is a lot of philosophy in your work. There needs to be more practical and real life experiences. I would suggest that you conduct interviews with people from industry to get a better understanding.	being practical is very important. reality must be seen from different perspectives	I think a lot more work is necessary and the practical part needs more emphasis
10			I have many reservations. We should talk. But let me just say that you will have to rigorously defend your contention that implementation failure in SA is 'due to a lack of culture-specific Lean implementation frameworks.' Lean, TQM, BPR, Six Sigma, and all the other packaged performance improvement and transformation frameworks mostly fail, not just in SA but everywhere. In any event, when can one ever declare 'success' - after six months, six years or a decade? Furthermore, I subscribe to the view (expressed by John Shook) that it is easier to get people to act their way to a better way of thinking than to think their way to a better way of acting. Your framework is too reliant on training (you must please define the nature of the training, as people learn by doing). You also need to define what you mean

			by culture - for me culture is a reflection of habits, and effective lean transformation requires habits to change in order to have widespread problem solving and creativity. Any implementation approach or framework can only be 'validated' by repeated trials. I have not seen anyone try to do that, though I have seen many implementation frameworks. Failure is much easier, and therefore more common, than success. Even were I to find your framework marvellous and ticking all the boxes for good implementation, I can assure you that it will be involved in many more failures than successes. Would one then want to say that the managers, etc. did not follow the framework properly? By the way, there was an excellent PhD done at RAU (now UJ) in the early 1980 comparing Japanese with SA corporate culture. I just cannot remember the author's name - he went on to an academic career in SA. I hope you have been able to source it. If I manage to remember his name, I'll let you know. Stick to your guns, and strength to your research.
11		There definitely is a low implementation success rate for Lean in South Africa. The roots of the Philosophy are not South African and incorporating the South African perspective may surely help in improving the success rate.	Great work as it seeks to improve the success rate of lean implementation which is something that has bothered many South African organisations for some time.
12	The presentation of the Lean-Ubuntu principles is well structured by the change model phases. For the Lean-Ubuntu house, the analogy is brilliant. I would like to suggest that the text is orientated left to right, with consideration for 9-11. A small suggestion, would be representing the philosophy as its base, in this way	The framework and change model stages are well categorised. For the LUP1, the implementation or understanding of a long term philosophy may need tactical and operational descriptors. For other phases that do not have tactical and operational phase 1 details, verbs understand (LUP 6 3.2,	Really well done on this novel and incredible research!

	"grounding". As for people, this could be part of the door - point of entry/means of successful implementation.	LUP8 3.1 & LUP10 2.1) feature. I would suggest mentioning a mechanism or phrasing with regards to "understand" for the long term philosophy to cascade down all levels of an organisation. This can also make the framework more responsive to changes in values or principles in the organisation. Alternatively, the phrasing on establishing expectations (LUP 9 2.1) can be incorporated here LUP 4 is justified well with no tactical and operational levels. A minor suggestion would be "partner/supplier awareness" for supervisors and floor workers in terms of engagement and enabling the organisation. For an organisation, it can be beneficial if all employees understand how different stakeholders interact and influence the them, as well as how their work/value benefits other stakeholders. LUP 4 - For the implementation and sustaining change column, only floor workers are tasked with investigating problems. Kindly consider making this a responsibility for a supervisor and floor workers - since at times, they (supervisors) would need to lead and partake in problem solving in groups. LUP14 - This comment is rather vague and may not be as relevant. In order to sustain change, knowledge management and CI archiving helps enforce and re-instill principles and information in the organisation. Kindly consider a form of knowledge management - maybe an upper management/supervisor role to log/store such progress. Please also consider if learning maturity	
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		can apply to this principle. It was also noted that industry relevance is assessed. This framework does enable and allow for cultural consideration for Lean implementation, but most explanations are tied to the concepts that still need further contextualisation. For example, SMED and Poke Yoke is mostly associated with manufacturing, but in ICT or service environments additional interpretation is needed. Depending on the power-relation and organisational structure in an industry/company, the weighting of change model phases or full extent of responsibilities between levels on the company will differ per industry - resulting in the score for statement 17.	
13		Well done. Quite a visual and interactive approach that even readers with limited knowledge on Lean and its management philosophies can follow.	
14			
15	I am not sure that I see how the model in its essence really differs from Lean as a Philosophy and what Lean in essence requires. Is UBUNTU what is really practiced culturally by the people who work in organisations in in SA?. What I have witnessed is a natural attitude of "this is my job description and I am not doing anything else to help". Does this help employees with low literacy and education?	In listening to the presentation. what I am hearing is what one would expect from any lean implementation. The low implementation rates in my opinion is due to lack of education regarding Lean among senior and middle management and their responsibility to change the culture of the organisation, and to see Lean as a way of living in the organisation and not just a quick fix. What would be useful in translating Lean principle into a more South African language instead of using the Japanese terms. Services is really where this is required. Speaking the Lean Japanese lingo often puts people of as this is something foreign especially the shop floor workers. UBUNTU also has its	The problem statement also already assumes a solution i.e. UBUNTU principles will solve the problem of low adoption rates of Lean in South African organisations. What is the real reason for low adoption rates in SA organisations? I sense that organised labour has a strong role to play in this. While UBUNTU is seen as the culture of Africa or South African, what is the real culture that is lived out in urban work settings as opposed to rural settings?

		shortfalls in that things like responsibility and accountability are not strongly emphasised, so I question the use of UBUNTU in this sense.	
16	please see comments at end of next section	This is very good research. I 4 on all the aspects regarding the design of the framework but I'm not sure it is work that has not been done before - in other words does the research provide a novel framework or just existing knowledge packaged in a new format/package by making use of the ubuntu philosophy. The reason for "disagree" to the statements above are as follows 1. How can we be certain that the failure of lean implementation is due to the existing lean principles that are not adopted for the South African culture? How has this been tested? Also, what are these cultural aspects specifically? In my experience, one of the reasons shopfloor workers were hesitant to adopt lean principles, was the fact that their jobs were in jeopardy since more could be done with less. This is the type of South African culture aspects of the work environment that the framework needs to address. 2. How does the framework differ from frameworks that already exist? For example, 3.2 says that training opportunities need to be created and attended. Is there not frameworks that already address/suggest this? This is why I disagree with statement 18. The researcher needs to prove that there is new knowledge, that she addresses/suggests new ways of dealing with specific "nameable" aspects of South African culture. Much of the content of the framework is already known i.e create a vision etc. 3. The reason why I dis4 with	As I said this is really good research and I hope my comments can enhance the research. Please see the comments given in this light and not as an attempt to negate the good work done

		statement 17 is because I suggest that specific cultural issues as I've mentioned in 1 above should be addressed i.e. job security and the strong allegiance with trade unions in the South African context.	
17			
18	Point 12 - the only "barriers" that comes to mind is perhaps the use of specific terminology in the framework (especially the table). Words such as Kanban, Andon, 5S, JIT etc. I don't think this is wrong or needs to be altered. As long as you mention somewhere how to ensure this won't be a barrier. The reason I especially think of it as a possible barrier is based on your statement in the video that the table is designed to be a poster in a working environment. Therefore, employees without knowledge of these aspects, might find it daunting when walking past it and reading it.	I think incorporating South African specific culture aspects, such as Ubuntu, is truly a good idea of contextualizing the lean philosophy to our country. It is clear that various aspects have been incorporated into the model (implementation aspects, change management aspects, lean, ubuntu etc.) and I believe this creates somewhat of a fail-proof model (I know that might be a bit optimistic, but I still think it comes very close to that).	Please take this research even further. Perhaps implementations, implementation related feedback. Truly creating a SA lean implementation plan that is used in industry!

APPENDIX C

Cronbach Alpha calculation

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APPENDIX D

Ethics Approval Letter

9/7/2020

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the North-West University Engineering Research Ethics Committee (NWU-ENG-REC) on 9/7/2020, the NWU-ENG-REC hereby approves your study as indicated below. This implies that the NWU-ENG-REC grants its permission that, provided the general and specific conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: A Lean implementation framework encompassing South African Ubuntu			
Principal Investigator/Study Supervisor/Researcher: Dr. Rojanette Coetzee			
Student: Mia Mangaroo-Pillay (25038230) 25038230@NWU.ac.za			
Ethics number:	NWU-00105-20-A1		
	Institution	Study Number	Year
	Status:	S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation	
Application Type: Single			
Approval date: 9/30/2020	Risk:	Low Risk	
Expiry date: 9/30/2021			
Approval of the study is provided for a year, after which continuation of the study is dependent on receipt and review of annual monitoring report and the concomitant issuing of a letter of continuation.			

General conditions: <i>While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:</i> • <i>The principal investigator/study supervisor/researcher must report in the prescribed format to the NWU-ENG-REC:</i> - <i>Annually on the monitoring of the study, whereby a letter of continuation will be provided annually, and upon completion of the study; and</i> - <i>without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.</i> • <i>The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the principal investigator/study supervisor/researcher must apply for approval of these amendments at the NWU-ENG-REC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.</i> • <i>Annually a number of studies may be randomly selected for active monitoring.</i> • <i>The date of approval indicates the first date that the study may be started.</i> • <i>In the interest of ethical responsibility, the NWU-ENG-REC reserves the right to:</i>

- *request access to any information or data at any time during the course or after completion of the study;*
- *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
- *withdraw or postpone approval if:*
 - *any unethical principles or practices of the study are revealed or suspected;*
 - *it becomes apparent that any relevant information was withheld from the NWU-ENG-REC or that information has been false or misrepresented;*
 - *submission of the annual monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and/or*
 - *new institutional rules, national legislation or international conventions deem it necessary.*
- *NWU-ENG-REC can be contacted for further information via ENG-REC@nwu.ac.za or 018 299 2645*

Special conditions of the research approval (if applicable): NA

Special in process conditions of the research for approval (if applicable): NA

The NWU-ENG-REC would like to remain at your service and wishes you well with your study. Please do not hesitate to contact the NWU-ENG-REC for any further enquiries or requests for assistance.

Yours sincerely,



Dr. Rojanette Coetzee
Chair NWU-ENG-REC

Current details:(25767984) \NWUNextCloud\ENG-REC\Letters sent\[Date]9.1.5.4.3_NWU-ENG-REC_REC_EAL_[student surname_name]

File Reference: 9.1.5.4.2